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DEPARTMENT OF AGRICULTURE

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Contents

Agriculture on the Darling Downs.

J. HART, Adviser in Agriculture.

THE Darling Downs (Plate 1), to the west of the main Dividing Range, is a stretch of very fertile, mainly open plain country covering an area of about 5,625 square miles, most of which is freehold tenure. The greater part of the 3½ million acres which comprises this well known tract of country is suitable for cultivation.

An obelisk to the memory of Allan Cunningham has been erected at Cunningham's Gap, a break in the Main Range through which this botanist-explorer passed when he discovered the Darling Downs in 1828. The first station on the Downs was taken up in 1840 and in 1842 the area was thrown open for general settlement and pastoralists gradually occupied the area. Some cultivation was practised, but these pastoral holdings were devoted mainly to pastoral pursuits for many years and it was not until the dawn of the 20th century that agricultural development really expanded. One by one, the larger holdings have been subdivided. To complete this process, the few remaining large holdings are now being split up for closer settlement under the War Service Land Settlement Scheme.

During the years 1930-33 the Downs entered one of the most important phases of its development. Two outstanding changes which contributed to this development were, firstly, the introduction of *Cactoblastis cactorum* to effectively combat prickly pear, which prior to 1930 occupied extensive tracts of country in this area, and secondly, the expansion of the wheatgrowing industry in the Dalby district, which centre now grows one-third of the State's wheat crop.

To-day, the Darling Downs is the most important agricultural area in Queensland, for in addition to producing the bulk of the State's grain harvest it supports a large dairying industry and an ever-increasing fat lamb and cattle industry.

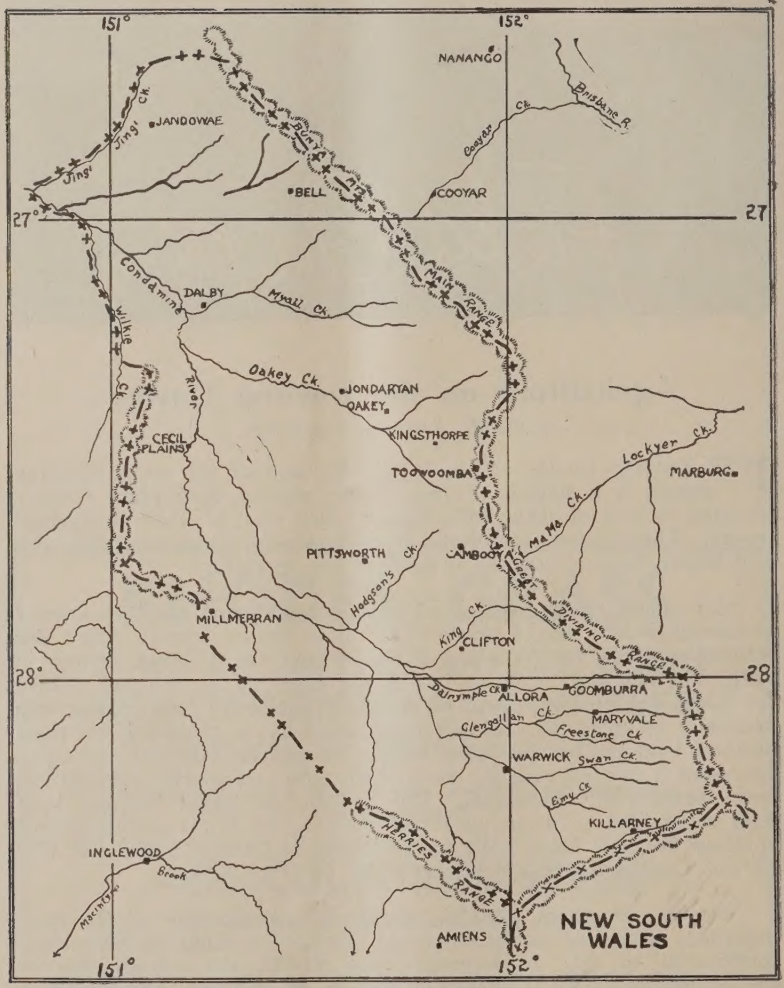


Plate 1.
SKETCH MAP OF THE DARLING DOWNS.

CLIMATE.

Table 1 gives meteorological data for Toowoomba, Dalby, Warwick and Pittsworth.

TABLE 1.

METEOROLOGICAL DATA FOR DARLING DOWNS CENTRES.

*	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Toowoomba.													
a ..	81·6	80·5	77·8	73·7	67·1	61·8	61·1	64·5	70·8	76·1	80·4	82·5	73·2
b ..	60·7	60·9	58·3	52·5	46·2	42·5	40·2	41·6	46·9	51·8	56·4	59·5	51·5
c ..	506	451	381	254	219	252	203	169	214	257	319	431	3,656
Dalby.													
a ..	89·3	88·7	85·6	80·3	73·1	67·2	66·3	70·0	76·3	82·9	87·8	89·7	79·8
b ..	64·3	63·9	60·5	53·8	46·1	42·3	39·4	41·0	47·9	54·6	60·2	63·9	53·2
c ..	332	284	276	133	130	171	172	123	168	200	266	321	2,577
Warwick.													
a ..	85·2	84·4	81·2	76·6	69·6	64·1	63·3	66·4	73·1	78·7	83·8	86·1	76·8
b ..	62·6	62·4	58·9	52·3	44·2	40·5	37·5	38·5	43·9	51·1	57·4	60·9	50·1
c ..	355	313	356	164	154	180	182	151	180	229	255	340	2,759
Pittsworth.													
a ..	85·7	84·7	81·8	76·5	68·5	62·8	61·6	65·4	72·4	78·9	84·1	85·8	75·7
b ..	62·4	61·7	59·2	53·8	47·0	43·5	41·2	42·8	48·2	53·6	58·6	61·2	52·8
c ..	387	315	319	152	143	185	177	124	166	216	270	349	2,803

*a =mean maximum temperatures; b=mean minimum temperatures; c=average rainfall in points.

The mean maximum and minimum temperatures for Toowoomba, Dalby, Warwick and Pittsworth are based on 25, 24, 24 and 23-year records, respectively, and rainfall averages on 59, 61, 61 and 44-year records, respectively.

Whilst other meteorological information would be required to give a complete picture, the table gives some indication of the climatic conditions experienced on the Darling Downs. The figures, however, give an exaggerated picture of climatic reliability and uniformity. Storm rains, which provide about half the annual rainfall during the summer months (November to March), are most unreliable and it is not unusual for the whole of the Downs to receive little or no rain for periods ranging from 6 to 10 weeks during these months. Heat waves often accompany these dry spells.

The winter rainfall, usually of a more general nature than the summer rainfall, is similarly unreliable.

SOILS AND VEGETATION.

For convenience of discussion, the Darling Downs is divided into three main areas, each being more or less confined to particular soil types. These areas are as follows:—

1. *The Eastern Downs* (Plates 2–4):—This contains two subdivisions:—

(*a*) The undulating and hilly country of the eastern and north-eastern portion, typified by open eucalyptus forest and black soils.

(*b*) The undulating country of the Toowoomba district and the extreme north-eastern fringe of the Downs, typified by open eucalyptus forest and red loam soils.

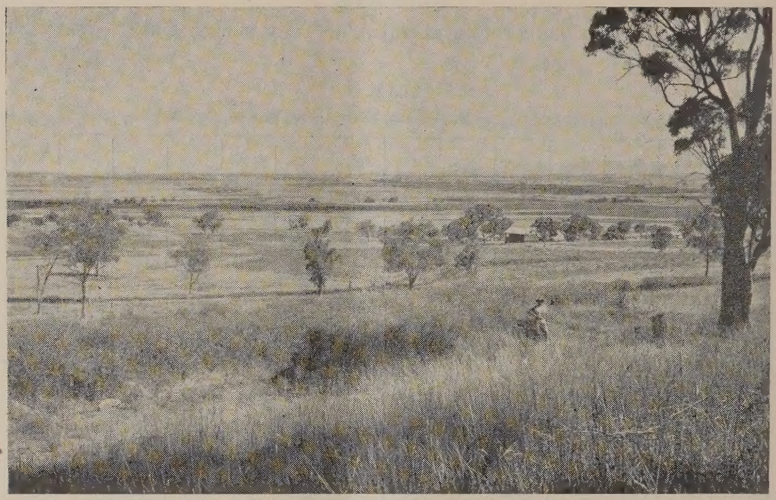


Plate 2.

SWAN VALLEY AT HERMITAGE, NEAR WARWICK.—Note the absorption banks, sown to Rhodes grass, to protect the lower slopes from erosion.

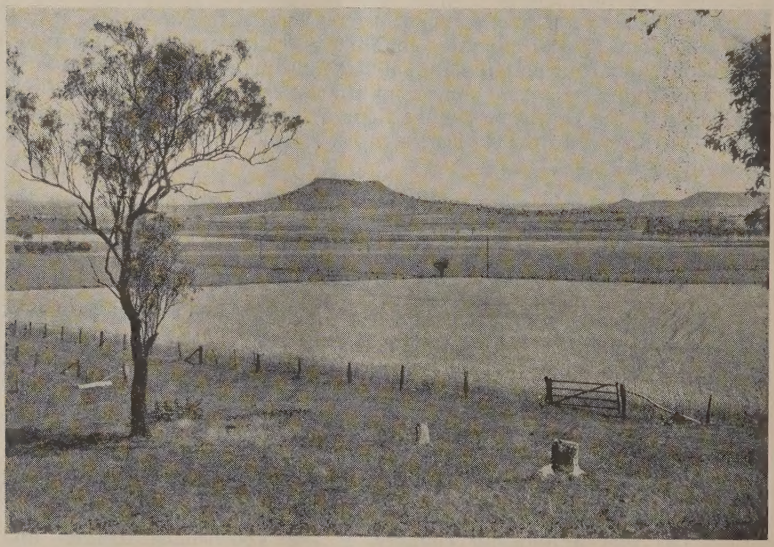


Plate 3.

WHEATFIELDS AT CHARLTON, NEAR TOOWOOMBA.

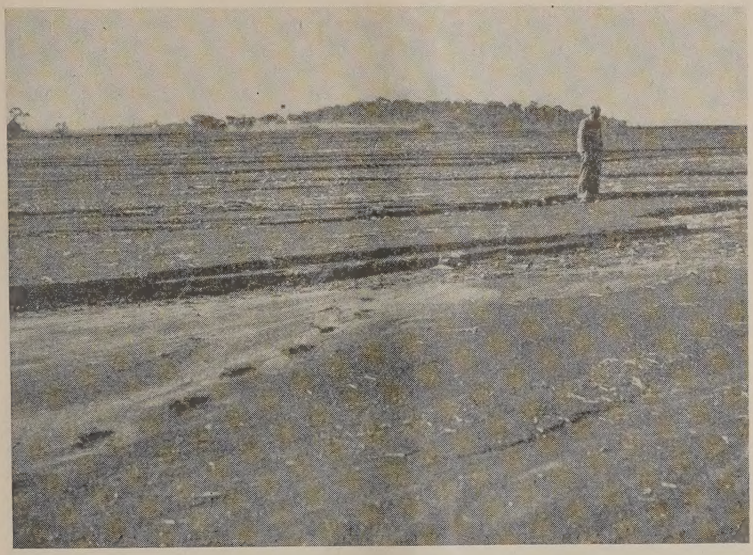


Plate 4.
SHEET EROSION ON A CULTIVATED FIELD NEAR ALLORA, EASTERN DOWNS.

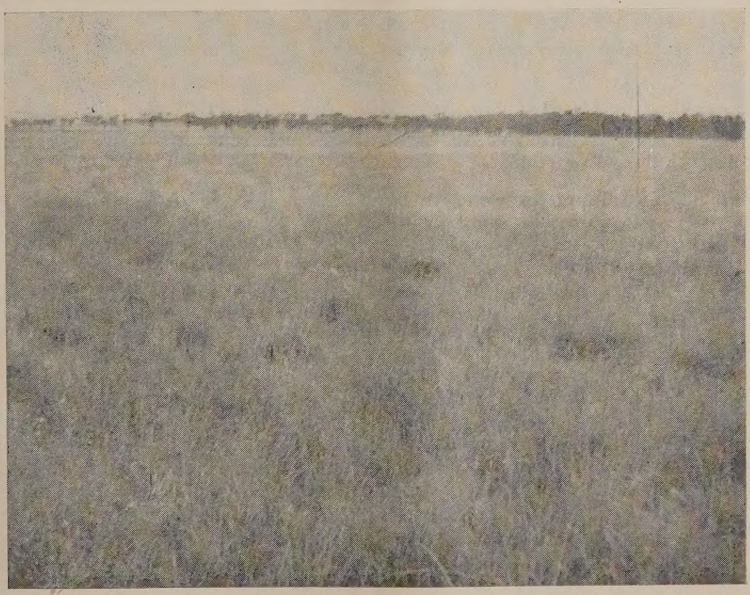


Plate 5.
OPEN GRASSED PLAIN ON THE NORTH-WESTERN PORTION OF THE DOWNS BETWEEN DALBY AND BELL.

Plate 6.

OPEN FOREST COUNTRY ON THE NORTH-WESTERN PORTION OF THE DOWNS BETWEEN DALBY AND BELL.

2. *The Downs Proper.*—Open, treeless, blue grass plains; self mulching black earths.

3. *The Western Downs*:—This area contains two definite regions:—

(*a*) The brigalow-belah association of the west and north-western Darling Downs.

(*b*) Open poplar box forests of the Dalby and northern districts.

The major portion of the Darling Downs is, as the name suggests, flat and featureless open plain country, broken on occasions by rocky outcrops. The deep black soil was formed under a grassland vegetation subjected to conditions of summer rainfall and winter drought. Such conditions have given rise to a soil moderately high in organic matter and well supplied with the major mineral plant foods—lime, phosphate and potash. Under natural conditions, this soil has a well-developed structure, while the surface is self mulching, friable, and in spite of its heavy texture fairly permeable to water. These soils, owing to their high clay content, have a very good moisture retaining capacity. Deep, black soils occur in other parts of the world where climatic conditions are similar to those of the Darling Downs, such areas constituting the principal grain-producing soils of the world; the famous "black earths" of Russia are an example.

This open grassland country, where Queensland blue grass (*Dichanthium sericeum*) and pitted blue grass (*Bothriochloa decipiens*) now predominate, is for the most part devoid of trees, narrow leaf ironbark (*Eucalyptus crebra*) and silver leaf ironbark (*Eucalyptus melanophloia*) being found only on the low rocky outcrops that occur at infrequent intervals throughout the region.

A similar black-soil type occurs on the undulating and hilly country of the eastern and north-eastern Downs overlying basaltic parent material. This soil, though deep according to usual standards, has a shallower profile than the open downs soils. It is well supplied with plant foods, though in some cases to a lesser degree than the soil of the open plain country. This undulating and hilly portion of the Darling Downs is mostly open forest country carrying smooth-bark trees or gums interspersed with box and stringybark (*Eucalyptus* sp.).

The extreme eastern and north-eastern fringe of the Darling Downs is characterised by a red, loamy soil formed from basalt and deriving its red colour from the free iron oxide formed during the process of weathering. This soil type is far less extensive than those previously mentioned, but is nevertheless quite important from an agricultural viewpoint. The soil is free working and permeable and with a fairly high level of fertility, though inferior to the black earths in both fertility and moisture holding capacity.

Towards the north-western portion of the Downs the open grasslands are replaced by open eucalyptus forest, poplar box (*Eucalyptus populifolia*) being the predominant species. The soil of this association is a type of black earth, but the surface soil though heavy is of a slightly lighter texture and of lower fertility than the more typical black earths of the true downs country. In the natural state, the structure of this soil is only moderately well developed, though under cultivation it is found to mulch fairly readily. Over-all, this soil compares favourably with the more fertile black earths of the open plain country to the south-east.

Stands of relatively dense timber, comprising chiefly brigalow (*Acacia harpophylla*) and belah (*Casuarina lepidophloia*) and occurring mostly in the north and north-west of the Darling Downs, are associated with a class of soil similar in many respects to that of the open downs but different in that the subsoil, at depths of 3–4 feet, is a stiff, grey clay not readily permeable to water. It is probable that these soils have developed in areas where drainage within the soil has been restricted because of changes in the local topography.

A further soil type of relatively minor importance may be found at intervals throughout the heavier black earths. This is a soil formed from light-textured parent material and as a consequence is of a definite sandy nature; it is described as a red-brown earth. It is a loamy soil, moderately fertile and well supplied with lime in the deeper subsoil. This soil can be found on the slightly more elevated portions of the Downs, particularly in the Oakey district. Being more sandy in texture, it is less fertile than the black earths, has an inferior moisture retaining capacity, and accordingly requires more special management for crop production.

Fertilizers and other soil amendments are not used to any great extent in the production of crops on the Darling Downs soils, but some interest is being shown in the use of superphosphate, particularly in the Warwick district.

Soil erosion, especially during the high intensity summer storm rains, is a serious problem in the area defined as the Eastern Downs (see Plate 4), much of which consists of sloping land. Clean cultivation and bare fallowing through the summer months have contributed in a large measure to this problem. Many acres will become useless for cultivated crops unless erosion can be checked. It is strongly recommended that farmers avail themselves of the services of the Department of Agriculture and Stock in combating this menace.

It is indeed fortunate that the valuable open plain country, which is also bare fallowed over the summer months of storm rains, is not subject to water erosion to the same extent as the Eastern Downs country.

WATER FACILITIES.

Natural watercourses such as creeks and rivers play a very minor part in the provision of water for stock and irrigation purposes on the Darling Downs. Good sub-artesian supplies are available over the whole area, but in very few instances is the supply sufficient to permit pumping for irrigation. The depth at which water is available varies from 50 feet to 400 feet, approximately. The shallow supplies are generally found on the open plain country, where the water, though satisfactory for stock, is mostly unsuitable for irrigation. Before being used extensively for irrigation, water from bores and wells should first be submitted for analysis to determine its suitability or otherwise for this purpose.

PASTURES.

These may be broadly divided into (*a*) native pastures and (*b*) sown pastures.

Native Pastures.

Queensland blue and pitted blue grasses are the predominant species whilst love grasses (*Eragrostis* species), kangaroo and oat grasses (*Themeda* species), Flinders grasses (*Iseilema* species), native millets (*Setaria* species), and species of *Sporobolus* form a minor part of the native grass association. Legumes, especially burr medic (*Medicago denticulata*) in the winter and spring, and other herbage are important constituents.

The pasture plants, though generally nutritious, are mainly summer growing and do not withstand intensive grazing. If heavy and continuous stocking is practised, many of the species are replaced by the inferior pitted blue grass. Such conditions have led agriculturalists to investigate the possibilities of sown pastures.

Sown Pastures.

None of the sown pasture species available in Australia is particularly suited for permanent pasture on the Eastern Downs or the Downs proper.

Rhodes grass (*Chloris gayana*) is most commonly selected for sown pastures, being found mostly in the brigalow-belah country, where it forms the principal fodder in the Western Downs dairying districts. After the scrub has been felled and allowed to stand until such time as all suckers have been destroyed, the area is fired and then sown to Rhodes grass. A Rhodes grass-lucerne mixture is preferable to the pure grass stand and the sowing of 8 lb. Rhodes grass with 1 to 2 lb. of lucerne is recommended.

Urochloa (liverseed) grass (*Urochloa panicoides*) has been used as a summer pasture in some areas—mainly in the Eastern Downs areas—but this grass is not entirely satisfactory, requiring good rains to stimulate and maintain reasonable growth.

Other grasses which have been tried, particularly for winter fodder, are prairie grass (*Bromus unioloides*) and Toowoomba canary grass (*Phalaris tuberosa*). These, though still being persevered with in some quarters, are not recommended for this area.

Plants which are sometimes weeds of cultivations are of importance in pastures. These mostly comprise various legumes—particularly clovers and trefoils—and numerous species belonging to such plant families as the Chenopodiaceae, Amarantaceae and Malvaceae. Burr medic, in particular, is a very useful constituent of the pastures in winter and spring.

[TO BE CONTINUED.]

SOIL AND WATER ANALYSES

★ ★

Attention of producers is drawn to the fact that the following analyses are carried out, free of charge, by the Department of Agriculture and Stock:—

1. Soil samples for fertility measurements;
2. Water samples to determine their suitability or otherwise for irrigation or stock use.

Unfortunately, in the past, many samples have been submitted which were valueless, either because they were incorrectly taken or were too small in quantity. **It is essential therefore that the information hereunder be strictly followed.**

SOIL SAMPLE

When analysing soil it is essential that details of the history of the area of ground in question be known. In addition, samples should be taken according to a set pattern. Therefore, when an analysis is desired, a request for instructions as to the correct method of taking samples of soil should be forwarded to the Department of Agriculture and Stock, William Street, Brisbane.

WATER SAMPLE

Samples of water should be taken, in the case of established wells or bores, after the pump has been running for some time. The bottle (same capacity as a beer bottle) to be used for taking the sample should be well washed and then rinsed out several times with the water to be tested before being filled. About 1 inch air space only should be left between the cork and the water.

In all cases, covering letters should accompany samples which should be marked clearly with the sender's name and address and forwarded to the Department of Agriculture and Stock, William Street, Brisbane.

PLANT PROTECTION

Tomato Diseases and Their Control.

J. E. C. ABERDEEN (Formerly Pathologist, Science Branch).

(*Continued from page 344 of June issue.*)

FUSARIUM WILT.

THE first indication that a plant is infected with Fusarium wilt is given by a cessation of growth but this symptom frequently passes unobserved. The next symptom is provided by the leaves, for those near the base of the plant commence to turn yellow and die. Then, a week to a month later, according to whether temperatures are high or moderate, the entire plant becomes wilted. Sometimes the infected plant does not die but remains in a stunted state for several months.

Plate 7.

FUSARIUM WILT.—In the affected stem on the left the brown streaks in the woody water-conducting tissue are evident.

Further features of Fusarium wilt infection are that a diseased leaf readily breaks away from the stem, and, if the bark is stripped off the plant just above the ground level, brown streaks will be seen in the woody water-conducting tissue (Plate 7). In severe cases the dark streaks extend around the entire stem, so that if the stem is cut across with a sharp knife a dark, narrow ring shows up just inside the bark. A further characteristic feature is that often only one branch of the plant is infected. In such a case, if the growing period is entering the cooler part of the year, the plant may produce a number of healthy branches and a payable crop still be harvested.

This disease is caused by a fungus (*Fusarium bulbigenum lycopersici*) which penetrates the roots and grows up through the water-conducting vessels of the stems and leaf stalks, causing interference with the passage of water through the plant. This blockage, together with the action of a poisonous substance produced by the fungus, causes wilting. The fungus also occasionally grows from the stem into the developing fruit and infects the seed.

The fungus is usually introduced to a farm with the seed and carries over from season to season in the soil. The disease may be spread by soil washing across lower slopes, by ploughs or other implements, or by moving the residue of an infected crop on to an uninfested area prior to destroying it.

This disease requires warm temperatures, with an optimum of 80°–90° F., for its development and consequently only affects plants growing during the spring and summer months. Light-textured soils tend to produce a greater incidence than heavy soils, and an acid soil also accentuates the trouble.

Fusarium wilt is present in practically every warm-temperate, sub-tropical and tropical tomato-growing area in the world. In Queensland it is still a limiting factor for summer crops, and any soil which has grown tomatoes for a number of years may be assumed to be infected with the Fusarium wilt organism.

Control.

The main line of control for Fusarium wilt is to use "resistant" varieties. It should be understood, however, that the term "resistant variety" is really a relative one and under conditions very favourable to wilt most of these varieties show a high percentage of infection. The outstanding variety for resistance to this wilt is Pan-America, but as it sets such a light crop under Queensland conditions it cannot be recommended for commercial use. Suitable so-called resistant varieties are Rutgers, Break o' Day, Valiant, Red Marbio, Pritchard, Pearson and Marglobe among the larger-fruited varieties; and Marvana, Sensation, Australian Earliana, Walker's Recruit and Potentate from the smaller-fruited types. Salads Special, Sioux and Grosse Lisse possess some measure of resistance, but probably not as high as Rutgers, and would be best included with the susceptible varieties. Among the definitely susceptible varieties are Chalk's Early Jewel, Bonny Best, Rouge de Marmande, Earliwinner and Earliana.

Subsidiary control measures, such as careful selection of seed-bed site and the destruction of diseased plants by burning after the crop is finished, are again strongly recommended.

VERTICILLIUM WILT.

The symptoms of Verticillium wilt are very similar to those already described as characteristic of Fusarium wilt, both in the manner of wilting of the affected plants and in the discolouration of the water-conducting vessels. This disease, however, only shows up in the winter and the older leaves of attacked plants tend to dry and wither without the preliminary yellowing which is characteristic of Fusarium wilt. There is also a tendency for the vascular darkening to occur only in the base of the stem. The diagnosis is often further complicated by the fact that some Fusarium infections may carry over into winter following their initiation the previous autumn, so that both Fusarium and Verticillium infections are present in the same crop.

This disease is caused by a fungus (*Verticillium albo-atrum*). Since it is restricted in its activity to the coldest months of the year, the variety which is most frequently attacked is Salads Special. While the trouble is widely distributed it is of economic importance only in the Brisbane-Redlands district.

Control.

The only control measures which can be recommended for dealing with Verticillium wilt are crop rotation and the use of healthy seed. No varieties which are resistant to the disease can be recommended because, though at least one (Riverside) is resistant, it does not set fruit freely in winter time. It must be assumed that the organism is present in the soils of most of the older tomato farms in the districts where it is important.

BACTERIAL WILT.

The first symptom of bacterial wilt infection is a slight stunting of the attacked plant, but the symptom which is generally noticed is the spectacular collapse of what appears to be a vigorously-growing healthy plant (Plate 8). This collapse may be complete within 24 hours and may show no preliminary symptoms on the lower leaves; in this respect it differs from Fusarium wilt. The water-conducting vessels under the bark are often discoloured, as in the latter disease, but when the stem of a bacterial wilt infected plant is cut across just above soil level a slimy ooze is often, but not always, apparent. It is never present in Fusarium wilt.

Bacterial wilt is caused by a bacterium (*Xanthomonas solanacearum*) and in this respect it differs from the two previously discussed wilts, both of which are the result of fungous infection. It appears, however, to be very localised in its occurrence; for example, in one large district only portions of individual farms are affected. The tendency is for the lower and moister portions of the properties to show the greatest incidence of the disease. Unlike Fusarium wilt, bacterial wilt is favoured by alkaline soils. The soil may receive its primary contamination from infected seed, but it is possible that virgin soil may be infested. Like Fusarium wilt, this disease occurs only in warm weather, the most favourable temperature being approximately 75° F. It also is carried over from one season to another in the soil.

Plate 8.

BACTERIAL WILT.—The collapse of the plant is shown.

Bacterial wilt occurs in most tomato-growing countries and has been recorded from the majority of the tomato-growing areas in Queensland. It is only of economic importance to the late summer crops of tomatoes. The disease may also attack potatoes, eggplants and tobacco, so the presence of these crops on a farm may accentuate its occurrence.

Control.

Soil treatment with sulphur has been successfully employed in the United States of America for dealing with this disease, but tests of this control measure have given only partial success in Queensland. Therefore, it is not at present considered that the adoption of this treatment is warranted under Queensland conditions. So far as resistant varieties are concerned, the only commercial variety that has shown any degree of resistance to bacterial wilt is Sensation. This variety has several disadvantages. It needs to be trellised and pruned to develop fruit of reasonable size and also has a distinct tendency towards puffy fruit. Break o' Day, Marglobe and similar varieties are extremely susceptible to the disease.

It would appear, therefore, that losses due to bacterial wilt may best be minimised by the adoption of seed selection and disinfection and by refraining from growing crops of tomatoes on infected soil during the warmer months of the year.

DAMPING OFF.

The first indication of this disease is patches of several seedlings in the seed-bed lying flat on the soil. A further characteristic is that the leaves and stem of the seedling at the time of the collapse are still quite green, turgid and healthy. If the root is carefully dug up and the plant examined, a small water-soaked area will be noticed on the stem at what was the soil level, and it is at this point that the seedling has collapsed.

The disease is caused by several fungi, of which a *Pythium* is probably the commonest. The fungi may be present in any unsterilized seed-bed and usually attack the plants in their early stages—that is, prior to the development of the first true leaves. After the plant is "hardened," damping off rarely causes trouble.

The disease is aggravated by wet, shaded conditions.

Control.

If the disease is consistently present, then the following precautions will be necessary:—

(i.) Seed treatment;

(ii.) Sterilization of the seed-bed soil;

(iii.) Improved control of growing conditions;

(iv.) Chemical treatment of the seed-bed after the seedlings have emerged.

Under average conditions, however, special precautions are not required. Seed treatment should be already practised as a routine measure. Sterilization of the seed-bed soil need not be emphasized unless the disease or some other seed-bed disease is consistently present. Further details on this subject are given in the section on "Care and Management of the Seed-bed." The main emphasis must be placed on the control of growing conditions and the essential point is to avoid excessive moisture lying in the seed-bed. This may be achieved by good drainage, a sunny location, planting seed in rows and careful watering (such as avoiding very frequent light waterings which maintain a film of free moisture on the surface of the bed).

If damping off does appear, it is advisable to dry out the bed as far as practicable and apply a chemical treatment. Suitable chemical treatments are with Cheshunt mixture, potassium permanganate (Condy's crystals) or one of the copper sprays.

Cheshunt mixture is made up according to the following formula:—Finely-powdered bluestone (copper sulphate) 2 parts by weight and fresh finely-powdered rock ammonia (ammonium carbonate) 11 parts by weight are thoroughly mixed and stored in a tightly-stoppered glass or earthenware vessel for at least 24 hours before use. One ounce of this dry mixture is dissolved in 2 gallons of water and sufficient used to wet the bed thoroughly.

Condy's crystals at the rate of 1 oz. to a gallon is a convenient substitute.

If using one of the copper sprays, it is made up at the same strength as for spray application and watered on the bed as above.

MOSAIC.

There are probably at least two different virus diseases which are grouped under this title and up to the present no attempt has been made to clearly differentiate them in the mind of the tomato-grower in Queensland. They are the common tomato mosaic and the tomato aucuba (or yellow) mosaic. Owing, however, to the fruit losses in some districts from what is apparently the aucuba form, separate descriptions of these diseases are given below.

Common mosaic of the tomato is identical with the disease of the same name which occurs on tobacco and may infect a large number of plants in the same family—for example, wild gooseberry, wild chili and black-berried nightshade—and is intertransmissible with these hosts. Affected plants in general are lighter green in colour than is normally the case in healthy tomatoes, and their foliage is slightly crinkled. A close examination of mosaic-infected plants also shows their leaves to be mottled with indefinite light and dark-green areas. Fruiting on such plants may not be appreciably affected by the presence of the disease when it is acquired late in the life of the plant, but if the plant is infected early the yield loss from mosaic can be serious, even if the disease is due to a form that is apparently mild in its effect on the vegetative growth.

Plate 9.

AUCUBA MOSAIC.—The mottling and distortion of the affected leaf on the right is seen in comparison with a healthy leaf on the left.

Mosaic is extremely infectious and is readily spread by the hands and by pruning knives, and to some extent by aphids. A proved source of infection is from the hands of tobacco smokers.

Aucuba (yellow) tomato mosaic is far more severe in its effect. The mottling produced varies in colour from yellow to dark-green and the actual distortion of the leaves is more accentuated then in common mosaic (Plate 9). Also, the fruits are often marked by yellowish rings and blotches. These blotches are more noticeable after the fruit colours, and have resulted in market condemnations of almost entire consignments. The transmission of this disease is the same as for common mosaic.

FERN-LEAF.

After a tomato plant has become infected with the virus causing this trouble, the first symptoms to appear are thickening and rolling of the leaf edges. At a later stage the terminal shoots become a mass of very narrow, distorted leaflets, all with thickened and curled edges, and if any fruit is borne by such plants it is malformed (Plate 10).

Plate 10.
FERN-LEAF.—Showing affected leaf and fruit in comparison with healthy leaf and fruit.

The virus causing this disease can infect a very wide range of species, including many common garden and crop plants. It causes cucumber mosaic and heart rot of bananas and is commonly known as the cucumber mosaic virus. Tomato mosaic virus may produce somewhat similar symptoms under certain conditions but it is thought that most of the fern-leaf seen in this State is due to the firstmentioned.

STREAK.

The least common of the tomato virus diseases in Queensland is the one called streak, regarding which little is known in this State. Elongated, slightly sunken greyish-black streaks or spots on the stem are characteristic of this virus disease, which may also produce lines on the leaf and brown irregular markings on the surface of the fruit.

CONTROL OF MOSAIC DISEASES, FERN-LEAF AND STREAK.

In the control of the tomato virus diseases described above, the emphasis must be placed on prevention and a large measure of success can be achieved by strict attention to certain precautions. Firstly, the seed-bed should be established on new land or on sterilized soil and all weed growth should be removed from its vicinity for some time prior to and during the propagation of the seedlings, because some hosts of the tomato mosaic may be present among these weeds. Furthermore, the seed-bed should not be located close to flower gardens because many ornamental plants are known to be capable of harbouring viruses affecting tomatoes. Seed should be selected from healthy plants only, for it has been demonstrated that certain virus diseases of tomatoes can be carried on seed.

Frequent inspections of the crop in the field are desirable, particularly while the plants are young. Any abnormal plants observed during these inspections should be removed and burned in order to avoid having them act as a source from which the virus can be spread to other and, as yet, unaffected plants. If the number of infected plants is relatively high—say greater than 10 per cent.—this measure may prove of little benefit. The hands and pruning knives should be washed in soap and running water after touching diseased plants so as to minimise the possibility of transmitting disease to healthy plants. Smokers should also thoroughly wash their hands as above before handling a tomato crop, as tobacco may be a source of infection. The remains of the crop should be cleaned up and burned as soon as it has ceased to be profitable and volunteer tomato and potato plants, Solanaceous weeds and other host plants, which are likely to carry these diseases on until the following season, should be eradicated. The excessive use of nitrogenous manures should be avoided as these appear to render the tomato plant rather susceptible to some of the virus diseases.

BIG BUD.

Big bud disease is probably known to all regular tomato growers. It is difficult to describe the appearance of the infected plant in words, but Plate 11 illustrates the most common symptom and makes obvious the reason for the name "big bud." Another type of symptom seen is that known as "rosetting." In this case shoots normally produced in the leaf axil appear as a bunched mass of small narrow leaves. Prior to these rather obvious symptoms there is actually a cessation in growth of the stem, which is often followed by a blueing of the growing tip, and the flower hands instead of curving downwards tend to point upwards. The bizarre forms leading to the name "big bud" are malformed flowers in which the stalks have thickened considerably and the flower itself becomes grossly distorted by an enlargement of the floral parts, while the petals assume a green colour.

The disease is due to a virus, and while only one insect has been proved to spread the disease there may be others. The incriminated carrier is one of the leafhoppers or jassids. It is a small sucking insect approximately $\frac{1}{8}$-inch long, of a grey-brown colour with speckled wings. The presence of leafhoppers generally is readily discerned by disturbing the bushes, which causes them to dart out for a short distance and then either return or lodge in the next bush.

Plate 11.
BIG BUD.—Typical symptom of the disease.

Usually a grower sees only an occasional plant affected with this trouble but in some districts there is a definite possibility of an appreciable economic loss. There are two important points to be noted with regard to its entry into the crop and subsequent spread:—

(1) The disease almost always enters the tomato crop from other hosts outside the crop itself.

(2) It is spread by an insect and not by handling, which is in contrast to mosaic.

On hosts other than tomato the "big bud" symptom is usually absent and the symptom common to most is that of green flowers. A rosetting effect is also fairly common. Well known plants which have been proved to be hosts in this and other States of Australia are weeds such as dock, nightshade, and sow thistle; and garden plants such as antirrhinum, gerbera, petunia, nasturtium, chrysanthemum, dahlia, geranium and phlox.

Control.

In the light of the above information on the spread of the disease the simplest means of control is to reduce the outside sources of infection and control the leafhopper within the crop. Complete elimination of other hosts is not possible but it is suggested that particular attention be paid to eliminating weeds on the headlands. For control of the leafhopper within the crop either 0·1 per cent. DDT spray or 2 per cent. DDT dust may be used. While the insect is prevalent, treatments will need to be repeated approximately every 10 days. It is unlikely that treatment need commence before November in southern Queensland, but it is recommended that the grower take good note of the leafhopper population in the adjacent weed areas. If this is high and there are indications that the weed growth may die off due to dry conditions or other causes then dusting or spraying will need to commence earlier. The removal and destruction of diseased plants as soon as detected should also assist in reducing the spread, but it should be realised that the plant is actually infected at least three weeks before the appearance of the noticeable symptoms. In northern Queensland the disease is active to some extent throughout the winter months also.

SPOTTED (BRONZE) WILT.

Spotted wilt is sometimes known as bronze wilt because of the fact that the young shoots of an infected plant develop a dark reddish-brown or bronzed appearance. This is produced by a more or less close aggregation of circular purplish-brown spots each measuring approximately $\frac{1}{8}$-inch in diameter (Plate 12). Other symptoms include the stoppage of active growth, the bending back of the leaf stalk, and the incurving of the blades of the leaflets, thus giving a drooping appearance to the plant. Leaves which have developed the bronzed appearance wither and finally dry up. Bronze markings or a blotched yellow and green appearance of the skin may develop occasionally on the fruit of affected plants.

This virus disease, like "big bud," is spread by insects and not by handling the plants. The insects in this case are two species of thrips. Coinciding with the rapid increase in thrips population in early spring that period is usually the main one for the incidence of spotted wilt. It also tends to be more prevalent in backyard gardens than in commercial vegetable areas. This is due to the number of ornamentals that may carry this same virus—for example, Iceland poppy, nasturtium, and dahlia.

This disease cannot be called a major problem in the main tomato-growing areas of Queensland, as the infection is usually less than 1 per cent. There are, however, some areas, such as the dairying areas west of Brisbane, where tomatoes are frequently grown as a side line, which have recorded relatively high infection percentages of up to 40 per cent., and that for a large proportion of the season.

Control.

The measures outlined under mosaic control are sufficient for most districts. Where the disease appears regularly each spring, definite preventive measures will be necessary. A 5 per cent. nicotine dust is the treatment recommended. The 2 per cent. DDT dust as used for

corn ear worm control may incidentally give sufficient control of the thrips. Treatment will need to commence in the very early spring months and carry on into early summer.

Plate 12.
SPOTTED OR BRONZE WILT.—Note the close aggregation of spots, causing mottling.

BLOSSOM-END ROT.

This disease is characterised by the appearance of a light-brown to black, roughly circular area at the blossom end of young green fruit (Plate 13). The tissue of this discoloured region is firm and may be shrunken to form a slight depression or flattening of the apex. A soft rot may appear in it, but such a development is due to the invasion of secondary organisms. The early symptoms of the trouble take the form of small light-brown stains on the apex of the fruit.

This trouble is a physiological one and is not due to the attack of any plant parasite. It is considered that blossom-end rot incidence is associated with differences in the rate of water uptake and transpiration by the plant. When the temperature is high and the amount of water vapour in the atmosphere is very low, the quantity of water

transpired by the foliage of a plant may be so high that the uptake of water by the roots is unable to keep pace with the loss of water from the leaves. This disturbance of the water balance in the plant reacts severely on the fruit and the cells at the apex collapse, causing the typical firm lesion to develop. A dry soil, by limiting the uptake of water by the roots, is conducive to the development of the trouble, but, on the other hand, plants growing in a soil which has dried gradually do not develop blossom-end rot as seriously as those which have experienced a period of heavy rain prior to the hot, dry weather. Infestation of the roots by nematodes, which reduce the efficiency of the roots as water absorbers, aggravates the trouble.

Blossom-end rot is a disease of tomatoes which is usually prevalent during hot, dry periods in summer and spring.

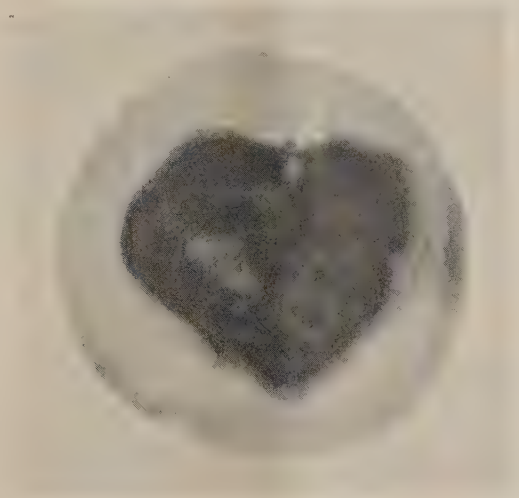


Plate 13.
Blossom-end Rot.

Control.

The control of this disease is, to some extent, beyond the power of the grower. However, he can help by providing an even supply of moisture throughout the growth of the crop by means of appropriate cultural practices and prudent irrigation. Heavy applications of fertilizers rich in nitrogen are undesirable, as these tend to produce abundant foliage, a condition which is conducive to the development of the trouble. When planting a crop it is well to remember that plants grown on the ground are less susceptible to the disease than are staked or trellised crops. If irrigation is not available the grower is strongly recommended to avoid staking or trellising his crop.

SHADE SPOT.

The most obvious symptom of this disease is apparent after the fruit has ripened, when areas of the fruit fail to colour. Beneath the skin in the affected area can be seen an indistinct brown discolouration due to the breakdown of vascular and surrounding tissue. The defect can also be detected on the mature green fruit, though the colour differentiation is only slight.

Observations up to the present indicate that the cause is physiological. The affected fruit are almost always from the first hand of unpruned tomato bushes and the factor most easily correlated with its occurrence is the reduced light occurring in the middle of the bushes, particularly in the winter and early spring. The seasonal effect may be due to the shorter days and aggravated possibly by lower temperatures.

This trouble does not cause heavy losses to the grower but is yet sufficiently serious to cause some concern.

Control.

The obvious means of control is to open out the centre of the unpruned bushes. On examining an average unpruned tomato bush it will be noticed that there are four to seven main stems on which the main crop is borne. Arising from these stems, particularly towards the centre of the bush, are a number of smaller shoots which tend to compact the centre of the bush, reducing the light intensity considerably. The majority of these smaller shoots would need to be removed and also some of the leaves.

CUTICLE BLOTCH.

The characteristic symptom here is the formation of an extensive dark lesion on the shoulder and side of the fruit which is most exposed. The lesion is only skin deep but after a few days the area tends to shrivel and flatten out and the skin becomes distinctly tough.

This disease is almost certainly physiological as it is invariably associated with periods of rain, particularly drizzly weather, occurring in the late winter and early spring. While a number of varieties are affected it is most commonly encountered on the trellised crops of Salads Special as this is the principal variety in fruit at this period of the year. The damage is usually associated with those areas of the cuticle which are covered with fine cracks and is possibly related to that occurring on citrus fruit in Queensland and known as "rind breakdown." It is usually apparent in winter-grown crops and can cause practically complete loss of all fruit that is approaching maturity during the crucial period.

Control.

There are no practicable means of control at present, though it is possible that certain varieties (for example, Salads Special) may be more susceptible than some others; these should be avoided where possible.

PUFFY FRUIT.

Fruits affected by puffiness have an angular flat-sided appearance and are springy to the feel. They are also lighter in weight than the normal fruit. On cutting the fruit across it is noticed that the central fleshy areas that normally carry the seed and pulp are so reduced that there are definite air spaces betwen the outside wall of the fruit and the seed-bearing portion.

This trouble is not due to any particular fungus or bacterium but is apparently caused by certain unfavourable growing conditions. The damage is considered to be done at the time when pollination of the fruit is taking place. The efficiency of pollination may be reduced by extremes of temperatures and soil moisture and so result in a poor development of seeds and the tissues that are associated with the seeds.

It is probably most important in the early spring crops. Some varieties are definitely more susceptible than others. The best general guide to the varietal susceptibility is given by the number of cells, or locules, that occur in the fruit. The smaller the number, the greater the loss from puffiness.

Control.

There are no definite recommendations for control. Overseas workers consider that excess nitrogenous fertilizer will encourage the disease, while the ample use of superphosphate will reduce it. The grower is recommended to make use of this information but must realise that puffiness may still occur to some extent.

SUNSCALD.

Sunscald is characterised by the appearance of a white patch on the shoulder or side of the green fruit that is most exposed to the sun. This spot is quite firm and tough and does not rot unless some secondary organism becomes established in the diseased tissue.

In general it only occurs in the hotter months in Queensland and often follows the defoliation of the plants by one of the leaf diseases or tomato mite.

Control.

Some varieties (for example, Break o' Day) carry such a sparse foliage that even under good growing conditions and no abnormal defoliation the fruit will sunscald. In general it is recommended that heavy foliaged varieties such as Rutgers be used for the hottest periods of the year and that such disease control measures as prevent loss of foliage be carried out.

CATFACE.

Some fruits develop a very irregular and malformed growth at the flower end (Plate 14). While certain environmental conditions such as poor pollination in winter and early spring may accentuate this trouble, it is definitely bound up with the variety used. Its economic importance is not as great as formerly owing to improved seed selection.

Control.

The most important measure here is to use seed only from reliable sources. In general the varieties with deep globular fruit have less catface than the flatter types of fruit, but careful selection of seed materials is the obvious control method.

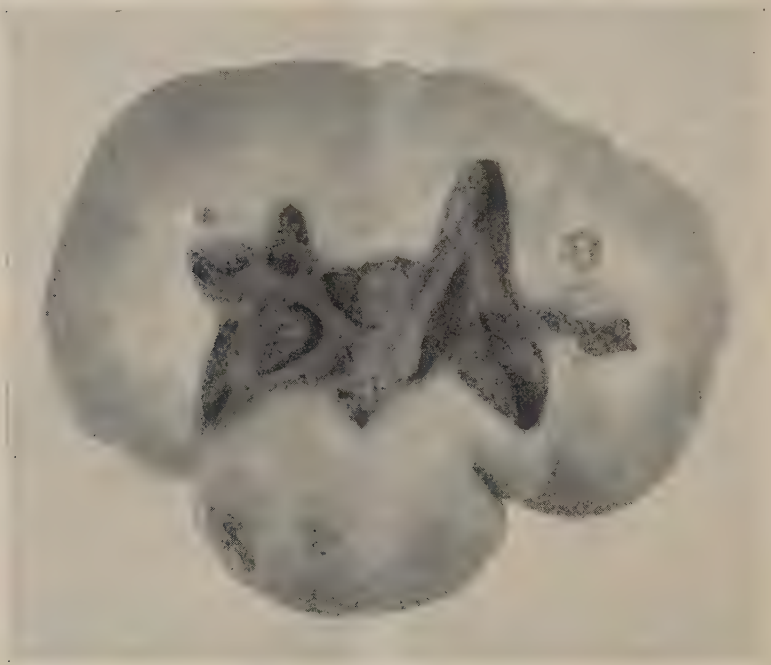


Plate 14.
CATFACE.

BLOSSOM-DROP.

The name given to this disorder adequately describes it. Actually blossom-drop is associated with a number of disorders and diseases but it has been separately mentioned here as it is sometimes the most obvious symptom.

First it must be realised that any backward stunted plant will often shed its flowers. Most growers are aware of this, but when vigorous healthy bushes do not set fruit the cause may not be obvious. The most likely reasons are as follows:—

(i.) If flower-drop occurs in July and August it is due to chilly nights preventing adequate pollination. English cluster varieties (for example, Salads Special and Potentate) and so-called Chinese varieties (such as Rouge de Marmande) are not as susceptible as the varieties Break o' Day, Rutgers, Earliana, &c., and should be used in this season.

(ii.) If flower-drop occurs in warmer parts of the year (autumn and late spring) the hand should be examined carefully for any lesions or spots. If small indefinite greasy lesions are present on the flower hand the cause is probably bacterial spot. If the lesions are possessed of rather definite edges, slightly shrunken and dull black in colour, the trouble is probably caused by the fungus responsible for target spot. Control in each case will be by the measures normally taken for the disease in question.

(iii.) Flower-drop may also occur on plants that have received an excess of nitrogenous fertilizers, particularly if the mixture has been unbalanced. This is more likely to occur in the warmer weather than the cooler months, because in the latter periods it is difficult to produce over-vigorous plants even when excess nitrogen is present.

[TO BE CONTINUED.]

The Young Farmer.

New Clubs.

May was a particularly busy month for the Junior Farmers' Club movement in Queensland, no fewer than six new clubs being formed in this period by the State Director (Mr. T. L. Williams). These were at Warwick (36 members), Allora (12), Wondai (12), Mondure (10), Cloyna (12), and Tiaro (15). The number of members at each centre is expected to show a considerable increase as Club work and activities become more widely known in the districts.

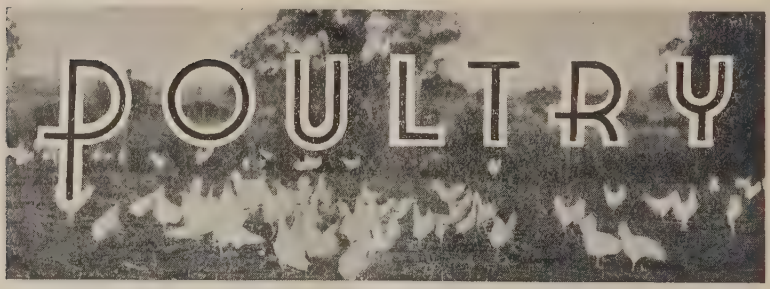
Murgon Show.

The State Director visited the three-day annual show of the Murgon Agricultural, Pastoral, and Horticultural Society and personally supervised the junior judging competitions sponsored by the Show Society and *Queensland Country Life* newspaper. These competitions were open for the first time to members of recognised junior farmers' clubs in the South Burnett area, as well as to farmers' sons residing within 30 miles of Murgon, with an age limit of 25 years. Two junior farmer members won the judging competitions for dairy stock (Jerseys) and pigs, the winners being E. W. Kerkow (Wondai) and R. O'Neill (Murgon), respectively. The A.I.S. judging competition was won by N. Shelton (Hivesville).

The Show Society also included in its schedule for the first time a farm produce section open to junior farm members only. This attracted several individual exhibits from both male and female members. A non-competitive exhibit from all districts where clubs have been operating for more than six months will be staged at the Royal National Show in Brisbane in August.

Central and Northern Tour.

Mr. Williams has in mind the formation of a number of clubs in central and northern districts and is making a tour for this purpose.



Poultry Nutrition: Principles and Practices.

P. RUMBALL, Officer in Charge, Poultry Branch, and F. N. J. MILNE, Assistant Husbandry Officer (Poultry).

(*Continued from page 363 of June issue.*)

OTHER ATTRIBUTES OF A FOOD WHICH MUST BE CONSIDERED.

Palatability.

NO matter how well-balanced a ration is it must also be attractive to the birds if sufficient food is to be consumed for normal functions. For example, barley as the grain portion of the ration contains almost the right quantities of protein and carbohydrate essential for egg production, but it is found in practice that fowls do not relish the grain and have to become accustomed to it. It may be as well to mention here that any alteration in the ration for laying stock should be made gradually, as sudden changes often cause a reduction in consumption with a consequent fall in egg yield. If this change is made in autumn when young pullets are just coming into production it may result in a false moult.

In the fowl the senses of taste and smell are poorly developed and food is in the first place selected by sight. In addition the food is judged by the touch, the feeling as it passes down the oesophagus and the sensation it gives to the crop and gizzard. Memory also plays an important part, because, from past experience, the fowls avoid those foods which cause them discomfort. Initially sight is the determining factor. The bird prefers the shiny surface of some grains to the dull surface of other grains; light-coloured foods are favoured above darker ones, and there is a definite liking for green.

The texture of the mash is of great importance. In palatability tests at the Nebraska Agricultural Experiment Station 200 Leghorn layers consumed 270 pounds of a coarsely ground mash, 175 pounds of a medium ground mash, and 115 pounds of a finely ground mash. The birds had free and equal access and all mashes were exactly the same except for the size of the particles of the three ingredients—maize, lucerne meal, and bran. In compounding the coarse mash, the maize and lucerne meal were ground with $\frac{1}{8}$ of-an-inch hammer mill screen, and all three (maize, lucerne meal, and bran), in the fine mash passed through a 1/32-of-an-inch screen.

The average results of a test of finely ground all-mash feeding against coarsely ground all-mash with Leghorn pullets at the Ohio Agricultural Experiment Station for two years running were:—

Mash.	Eggs per Bird.	Food per Bird.	Consumption per Doz. Eggs.	Mortality.
		Lb.	Lb.	%
Coarse ..	139·5	66·05	5·70	19·3
Fine ..	120·5	61·92	6·19	24·5

The advantages generally attributed to fine and coarsely ground mashes are:—(1) Finely ground mash has a better appearance, there is less picking over and wastage; (2) coarse granular mash is more palatable, and results in better food consumption and increased egg production; it is less subject to deterioration, costs less for grinding and retards the loss of vitamin A.

Very finely ground all-mash should not be fed to chickens, as the powdery fineness of the mash may penetrate the nasal passages and cause clogging.

Digestibility.

The chemical composition of a food will only give a rough indication of its value, since not all of the crude protein, carbohydrates, fats, and minerals is digested. Digestibility trials have been carried out on most species of domestic animals with common foodstuffs to determine the percentage of the various ingredients utilised. This percentage is the "digestibility coefficient" and is calculated as follows:—

$$\text{Digestibility Coefficient} = \frac{\text{Wt. of ingredient eaten} - \text{Wt. of ingredient excreted.}}{\text{Wt. of ingredient eaten.}}$$

In tests carried out in 1937 by E. T. Halnan, the digestibility coefficients of the constituents of bran for poultry were determined, and are given here in comparison with the values for sheep:—

Animal.	Crude Protein.	Crude Fibre.	Fat.	Carbohydrate.
	%	%	%	%
Fowl ..	60·5	9·2	53·3	38·7
Sheep ..	77·2	54·4	80·7	74·1

It can be seen that fibre in bran is digested to a much smaller extent by poultry than by sheep.

METHODS OF FEEDING.

Several methods of feeding are commonly practised, and in many instances with an equal degree of success. Each method has its own advantages and appeal to the individual feeder.

In any case it should be pointed out with as much emphasis as possible that it is far more important to supply poultry with adequate quantities of all of the necessary nutrients than it is to follow a given system. However, any system that ignores the principles of sanitation and economics may fail, no matter how well the poultry may be nourished.

The methods of feeding practised are known as (1) wet mash and grain, (2) dry mash and grain, (3) all-mash, (4) free choice, and (5) pellet feeding.

Wet Mash and Grain.

Wet mash is a mixture of various ingredients, moistened to the extent that when a handful is squeezed it will remain in mash form and when dropped a few inches will break into small particles. It would be more correct if this class of mash were termed "moist" instead of "wet."

With this type of feeding the mash must be prepared daily for distribution to the birds, care being taken to provide sufficient without allowing any to remain unconsumed half an hour after feeding. The mash should be placed in shallow narrow tins or troughs, and as the food should be consumed within about half an hour there should be no lack of feeding space, otherwise the timid birds will not procure all they require for maximum production.

It is usual to feed wet mash first thing in the morning and grain late in the afternoon. Many breeders reverse this order with successful results and find that it fits in better with the daily routine.

Dry Mash and Grain.

In this type of feeding, a mash similar to that used for a wet mash is prepared dry and placed in hoppers. Birds are at liberty to consume the food at will, and although certain feeding space has been found necessary for best results, the more timid fowl has a better chance of securing its requirements from a limited space than is the case in wet-mash feeding. The advantage of this system of feeding is that instead of mixing and feeding mash daily, a quantity can be prepared and distributed once a week, thus reducing the labour of feeding. A serious drawback, however, is that the constant supply of feed encourages rats to harbour in the poultry pens. With this system of feeding, grain is usually fed about 4 p.m.

All-Mash.

As the name suggests, nothing but mash is fed. A suitable mixture is made and placed in hoppers, to which the birds have access at all times throughout the day. With the all-mash system, quantities of food can be placed out once a week, thereby saving the daily attention of feeding. The birds are also compelled to consume a ration suitably balanced. Fowls do not take kindly to radical changes in grain-feeding, but with the all-mash system the meal of various grains may be substituted without any appreciable easing in production. Naturally, the conversion of grain into meals slightly increases the cost of feeding.

Free Choice or Cafeteria System.

Under this system of feeding, various kinds of foods are placed in hoppers or receptacles and the birds allowed to select their own requirements. The range of foodstuffs must be sufficiently wide to supply all

the food constituents essential to health and production. It has been noted that birds placed on this system of feeding after being fed by other methods have gorged on certain foods, but this gorging is only temporary. The birds soon adjust their feeding habits and consume only as much of the various foods as is necessary for health and production.

Pellet Feeding.

The pellet system of feeding is in effect a modification of the all-mash system in that an all-mash diet is first prepared and then made into pellets. The advantages claimed for it are that it does not permit the bird to pick out some of the ingredients and leave the others and that it tends to reduce the quantity of feed thrown from the hoppers and wasted. It does ensure that all the birds will eat the same kind of feed.

Feeding Systems Tested.

Experiments have indicated that the free choice system of feeding is very satisfactory, although there is little difference between it and the mash and grain system; and that the all-mash system of feeding is the most costly. Therefore, the all-mash system is not advocated for feeding laying stock, although with chickens under the age of eight weeks, where consumption is not great, it has given the most satisfactory results and proved economical.

The New South Wales Department of Agriculture has reported that in a comparison of wet-mash, dry-mash, and all-mash systems of feeding there was no difference as regards growth and economy of feeding up to the laying stage. Over 12 months laying there was no significant difference between the egg production from wet and dry mash, but the all-mash feeding was not as good as either of these systems. Experience in Queensland does not entirely support this work. In nutritional experiments conducted by this Department with chickens purchased as day-old from hatcheries and on dry all-mash feeding an average of 204 eggs has been obtained during the first year's lay and after culling during the second year 157 eggs.

Better production than the foregoing could not be expected under any feeding system. However, as all-mash feeding is the most costly, it cannot be recommended as a general practice.

FOOD REQUIREMENTS.

The first call made on the food digested is for maintenance of vital functions, such as the beating of the heart, breathing, repair of tissues, &c. Only after these requirements are met is digested food used for production. If fowls are not "full-fed" production suffers. "Full-fed" means as much of a balanced ration as the birds will eat. A hen in lay will consume approximately 4 oz. of food daily. This is a variable quantity and is influenced by the climatic and production conditions and breed characteristics. Heavy breeds consume more than light breeds.

TABLE 1.

PROTEIN AND FIBRE CONTENT OF SOME POULTRY FOODS.

Food.	Average Protein. Per cent.	Average Fibre. Per cent.
Group I.—Cereals.		
Maize and maize meal	9·5	3·0
Wheat and wheat meal	12·5	4·0
Barley and barley meal	10·6	5·0
Oats	10·0	11·0
Wheat bran	14·7	11·0
Pollard	14·5	7·4
Sorghum	10·0	7·0
Millet	11·6	8·0
Group II.—Animal Proteins.		
Meat and bone meal	45–55	..
Buttermilk, dried	35	..
Buttermilk protein	68	..
Skim milk, dried	37	..
Skim milk, fresh	3·8	..
Liver meal	62·5	..
Group III.—Vegetable Proteins.		
Linseed meal	28	12
Cottonseed meal	40	10
Cottonseed meal, standard	30	25
Peanut meal	48	6
Bean and pea meal	25	7
Coconut meal	18·5	12
Group IV.—Legumes.		
Lucerne leaf meal	22·0	15·0
Lucerne, before flowering	21·0	25·9
Lucerne, full flower	15·0	31·0
Lucerne chaff, good	20·7	20·0
Lucerne chaff, poor	16·6	25·2
Group V.—Supplements.		
Sterilized bone meal	13–20	..

FORMULATING RATIONS.

To prepare an all-mash ration, select at least three of the foods from Group I. in Table 1 (no more than two to be of wheat origin if only three are selected). This group comprises from 70 to 90 per cent. of the ration.

Select at least one food from Group II., this to make up from 5 to 10 per cent. of the ration unless skim milk is available. If skim milk is fed at the rate of 4 gallons per 100 birds daily, there will be no need to include any feeds from Group II. Also, if the milk is fed at this rate, the protein content of the ration can be reduced by 3 lb. per 100 lb.

If the feeds of Group II. are much more costly than those in Group III., include one food from Group III.

If no green feed is fed, include 5 lb. to 10 lb. per 100 lb. of either of the feeds in Group IV., depending on whether yellow maize is being fed. Whatever the ration, include ½ lb. of salt. For layers and growing stock, the full ration should contain approximately 15 lb. of protein and 8 lb. of fibre per 100 lb.

TABLE 2.

AVERAGE VITAMIN CONTENT OF SOME FEEDSTUFFS.

Kind.	Vitamin A. per lb. Inter. Units.	Vitamin B1. per lb. Inter. Units.	Vitamin D. per lb. A.O.A.C. Units.	Vitamin E. ‡	Vitamin B_2 (Riboflavin) Microgram per lb.
Barley	400	250	Trace	XX	400
Maize (Yellow)	3,180	270	†	XX	450
Maize (White)	0	270	†	XX	450
Cowpeas	1,360	450	†	*	350
Milo	250	*	†	*	400
Oats	80	270	†	XX	400
Peanut Meal	250	900	†	XX	1,200
Wheat	140	340	†	XX	400
Wheat Bran	150	450	†	XX	1,000
Wheat Germ Meal	1,900	1,930	†	XXXX	1,800
Wheat Middlings near Pollard	120	1,000	†	XXX	900
Cottonseed Meal	600	1,800	†	*	300
Linseed Meal	200	2,000	†	X	900
Buttermilk, Dried	200	400	Trace	X	9,000
Cod Liver Oil	340,190	0	45,360	0	0
Liver Meal	*	*	*	*	18,500
Meat Scrap	*	*	†	*	2,700
Skim Milk (Liquid)	15	40	†	X	1,000
Green Lucerne	63,560	225	†	XX	2,000
Lucerne Meal	13,000	400	†	XXX	5,000
Lucerne Leafmeal	32,000	400	14	XXX	7,000
Cabbage	200	100	†	*	100
Molasses	*	*	†	*	2,000
Kale	181,400	100	†	*	2,240

* Information on vitamin content is lacking.

† Means that the feedstuff contains no appreciable quantity of Vit. D.

‡ X Fair source of Vitamin E.; XX Good Source; XXX Very good source; XXXX Excellent source.

Extracted from the United States Department of Agriculture Year Book, 1939.

Where mash and grain are fed, the ration may be made up as with the all-mash ration, but allowance must be made for the fact that half of the ration will be fed separately as grain. In this case, the mash will have to be higher in protein in order to balance the low protein content of the grain portion of the ration, but the total of the two should supply the same amount of protein per 100 lb. of food fed.

In feeding laying hens, the effect of the foods upon the colour of the yolk of eggs should also receive consideration. Commercially, yolk colour does not appear to have caused any concern, but the consuming public do not favour pale-yolked eggs. To overcome this, green feed and yellow maize should form a part of a laying ration. In the absence of green feed, lucerne chaff or meal should be used.

TABLE 3.

AVERAGE MINERAL CONTENT OF SOME FEEDSTUFFS.

Kind.	Calcium.	Phosphorus.	Manganese.
	Per cent.	Per cent.	Per Million Parts.
Barley	·05	·36	16
Maize (Yellow)	·01	·29	5
Maize (White)	..	..	..
Cowpeas	·10	·46	30
Milo	·04	·32	15
Oats	·10	·44	20
Peanut Meal	·18	·56	Information Lacking*
Wheat	·04	·39	39
Wheat Bran	·11	1·21	119
Wheat Germ Meal	·07	1·01	160
Wheat Middlings	·08	·93	119
Cottonseed Meal	·23	1·18	18
Linseed Meal	·33	·74	40
Buttermilk, Dried	1·56	1·05	·4
Cod Liver Oil	..	..	..
Liver Meal	·11	·90	4
Meat Scrap	8·25	4·00	18
Skim Milk Liquid	·13	·11	Trace
Green Lucerne	·42	·07	7
Lucerne Meal	1·44	·21	26
Lucerne Leaf Meal	1·90	·22	30
Cabbage	·07	·04	21
Molasses	·56	·06	Information Lacking*
Kale	·18	·07	ditto

* Information on the manganese content is lacking, but since only relatively small amounts are used in mash manufacture, the contribution from this source would not be of any great value.

Extracted from the United States Department of Agriculture Year Book, 1939.

TABLE 4.

RECOMMENDED NUTRIENT ALLOWANCES FOR POULTRY.*

	Amount per lb. of Feed.	
	Starting Chicks.	Laying and Breeding Hens.
Total Protein (per cent.)	18–20 (*a*)	15–16
Vitamins—		
Vitamin A (International Units) (*b*)	2,000	3,300
Vitamin D (A.O.A.C. Units)	180	450
Thiamin (milligrams)	0·9	..
Riboflavin (micrograms)	1·6 (*c*)	1·3 (*c*)
Panthothenic Acid (milligrams)	5·0	7·0
Nicotinic Acid (milligrams)	6·0	..
Pyridoxin (milligrams)	1·6	1·6
Biotin (milligrams)	0·045	0·07
Choline (grams)	0·7	..
Minerals—		
Calcium (per cent.)	1·0	2·25 (*d*)
Phosphorus (per cent.)	0·6	0·75
Sodium Chloride (per cent.)	0·5	0·5
Manganese (parts per million)	..	50 (heavy breeds) 40 (light breeds)

(*a*) For growing chickens the protein content of the ration can be reduced to 16 per cent. by 12 weeks of age. Scratch grain feeding may be started at 6–8 weeks of age.

(*b*) May be either fish oil vitamin or provitamin A. from vegetable sources.

(*c*) The riboflavin content of rations for growing chickens after 8 weeks of age and of rations for laying hens is kept at the same level.

(*d*) This amount of calcium need not be incorporated in the mixed feed, since calcium supplements fed free choice are considered as part of the ration.

* The information is taken from "World's Poultry Science Journal." 1 lb. = 454 grams ; 1 gram. = 1,000 milligrams = 1,000,000 micrograms; 1 microgram = 1/454,000,000 lb.

Example.—To make a mash to be fed in conjunction with grain as an evening feed to laying hens requiring 15 per cent. of crude protein in the total ration:—

Ingredient.	Quantity.	Protein.	Fibre.
	Lb.	Lb.	Lb.
As Grain—			
Sorghum	25	2·50	1·00
Maize	25	2·37	0·75
As Mash—			
Maize Meal	15	1·42	0·45
Sorghum Meal	12	1·20	0·48
Bran	10	1·47	1·10
Meatmeal (55% protein)	6	3·30	..
Cottonseed Meal	2	0·80	0·37
Lucerne Chaff	5	0·85	1·50
Total	100	13·91	5·65

This ration is slightly deficient in protein. As the maximum amount of cottonseed meal has been used and the ration is still deficient in protein, peanut meal (a protein-rich food which can be used to a greater degree than cottonseed meal) will serve the purpose, displacing cottonseed meal and 3 per cent. of maize meal. The corrected ration will then be as follows:—

Ingredient.	Quantity.	Protein.	Fibre.
	Lb.	Lb.	Lb.
As Grain—			
Sorghum	25	2·50	1·00
Maize	25	2·37	0·75
As Mash—			
Maize Meal	12	1·16	0·36
Sorghum Meal	12	1·20	0·48
Bran	10	1·47	1·10
Meatmeal (55% protein)	6	3·30	..
Peanut Meal	5	2·40	0·30
Lucerne Chaff	5	0·85	1·50
Total	100	15·25	5·49

Let us now examine the vitamin and mineral content of this ration, as calculated from Tables 2 and 3, with particular reference to its vitamin A, riboflavin and manganese contents:—

Ingredient.	Quantity. Lb.	Vitamin A. I.U.	Riboflavin Micrograms.	Manganese Parts per Million.
As Grain—				
Sorghum	25	6,250	10,000	375
Maize	25	79,500	11,250	125
As Mash—				
Maize Meal	12	38,160	5,400	60
Sorghum Meal	12	3,000	4,800	180
Bran	10	1,500	10,000	1,190
Meat and Bone Meal ..	6	..	16,200	108
Peanut Meal	5	1,250	16,000	Not known
Lucerne Chaff	5	65,000	25,000	130
Total	100	194,660	88,650	2,168
Per lb.	..	1,946·6	886·5	21·6

Although this ration is now balanced as far as protein and fibre are concerned, it is definitely lacking in vitamin A, riboflavin and manganese. These levels are inadequate for layers, and the ration would give disastrous results as far as breeding stock are concerned.

Let us take each in turn:—

Vitamin A.—As shown in Table 4, the recommendation for layers and breeders is approximately 3,300 I.U. The vitamin A content of this ration can be built up in two ways:—(1) by the use of fresh green feed—at least 5 lb. per 100 birds daily; (2) by the use of a vitamin A supplement in the form of fish oil. If a fish oil of 1,000 I.U. potency per gram was used, at least ¾ per cent. would be added to an all-mash ration and twice this amount (1½ per cent.) to the mash-protein of a mash-grain ration. One per cent. equals about 1 pint (20 fluid ounces or 40 tablespoons) per 100 lb. With an oil of higher potency a lesser amount in proportion to the increased potency is necessary.

Riboflavin.—The estimated value is 450 micrograms short of the adequate allowance for layers and breeders. This shortage may be overcome in three ways:—

(1) By feeding green feed *ad lib.*; (2) By the use of liquid, dried or skim milk, buttermilk powders, dried whey, or liver meal. In this instance, using buttermilk powder it would be necessary to recast the ration and substitute an equivalent amount of buttermilk for peanut meal. If liver meal were used about half this quantity could be substituted for peanut meal.

(3) By including synthetic riboflavin in the mash. The amount used is very small and can be mixed with common salt, which, in this case, can be added as a supplement to the ration.

Manganese.—Because of the limited use of wheaten by-products (bran and pollard) this ration is inadequate as regards manganese. The manganese content could be lifted by recasting the whole ration and substituting bran for maize meal and part of the sorghum meal. Even then we would only succeed in approaching the minimum requirement of 40 p.p.m. for light breeds. Without recasting the ration, we can add a manganese supplement in the form of manganese sulphate to the mash at the rate of 4 oz. to the ton. This will ensure a supplemented level of 30 p.p.m., which, added to the amount already calculated, will give a value just over 50 p.p.m. The manganese sulphate could be incorporated in the salt and riboflavin mixture, which would now be as follows for mixing a ton of mash where salt mixture is used at the rate of 1 per cent.:—

Salt—20 lb.

Riboflavin supplement—as directed by the vendor.

Manganese sulphate—4 oz.

TABLE OF WEIGHTS AND MEASURES.

In order to prepare mashes with any degree of accuracy it is necessary for the various ingredients to be weighed. As scales are not

available on all farms the average weight of the various kinds of foodstuffs most commonly used is given for two convenient measures, the kerosene tin and the quart measure. These weights refer to the measures being filled but not pressed.

Kerosene Tin.

Bran	12 lb.	Maize (whole)	28 lb.
Pollard	18 lb.	Maize (cracked)	25 lb.
Lucerne meals	12 lb.	Wheat and Sorghum	30 lb.

Quart Measure.

	lb.	oz.		lb.	oz.
Barley meal	1	8	Linseed meal	1	0
Bone meal	1	12	Pollard	1	0
Bran	0	8	Salt (fine)	2	0
Maize (whole)	1	12	Wheat	1	12
Maize meal	1	8	Wheatmeal	1	8
Meatmeal	1	8			

Bushels to Short Ton.

Maize	35.7	Bran, Pollard	100
Barley	40		
Sorghum	33.3	Oats	50
Wheat	33.3		

THE FEEDING OF CHICKENS.

In the feeding of chickens it is most important to bear in mind that nature has provided for the first day or so of the chicken's life, as just prior to hatching the balance of the egg yolk is drawn into the abdomen of the chick. Most breeders allow at least 48 hours to elapse before feeding. Chickens fed earlier are subject to bowel trouble. If, however, feed is withheld after the 48 hours, weakness develops, from which many chickens will not recover.

Requirements of Growth.

Chickens make very rapid growth in the early part of their life. This development is most rapid during the first six to eight weeks, consequently rations having a relatively high protein content are necessary to give the best development. From experimentation it has been established that rations having a crude protein content of 18 to 20 per cent. should be used during the first six to eight weeks, and after that period this should be reduced to 15 per cent. The protein requirement of a chicken does not alter as sharply as this, but these periods and protein content are suggested as meeting the practical requirements of the poultry-raiser.

The practice adopted by many poultrymen of reducing the protein content of a ration after the chickens are about 16 weeks of age in order to delay sexual development is desirable if the birds are maturing

too rapidly. Development, however, can be controlled to only a very limited degree, and the danger of under feeding protein must be avoided, particularly with pullets that have just commenced laying and have still to make further development. With these birds it is better to slightly lift the protein level—16 per cent. is recommended. On the other hand, excessive protein feeding must be guarded against, as the over-feeding of protein-rich foods causes deposits of urates in the ureter, kidneys, and other organs, and places an undue strain upon the liver.

Table 5, showing the food consumption of chickens, has been compiled as a result of experiments conducted in this State, the ration used approximating Mixture 1 in Table 6.

TABLE 5.

FOOD CONSUMPTION OF CHICKENS.

Age.	Leghorns.		Australorps.	
	Weight of Chickens.	Food Consumed Weekly.	Weight of Chickens.	Food Consumed Weekly.
	Oz.	Oz.	Oz.	Oz.
Day old	1·3	..	1·36	..
1 week	1·97	1·64	2·14	1·53
2 weeks	3·31	3·36	3·61	3·32
3 weeks	5·31	4·80	5·84	5·05
4 weeks	7·61	6·46	8·68	7·20
5 weeks	9·94	7·58	12·08	6·89
6 weeks	12·92	8·96	15·86	10·62
7 weeks	16·65	8·65	20·17	13·95
8 weeks	20·41	13·29	25·31	15·05

The variation in weight from week to week and the ever-increasing amount of food required suggest the undesirability of laying down hard and fast rules as to what quantity should be supplied. The food requirements increase week by week, and a system of feeding which enables the growing birds to consume all they require is the most desirable.

By reason of the fact that the kind of food consumed is easily controlled, and that it is always in front of the birds, the all-mash system of feeding chickens is suggested as being the most desirable. All-mash should be placed in shallow trays about 1 inch in depth during the first few days. Trays of a depth of 2 inches should then be used, and by the end of the first week narrow trays or troughs 4 inches deep should replace these. At this age chickens will commence to scratch with more vigour, scattering the feed from the trough. This can be prevented by placing a piece of netting on top of the mash loose enough to sink as consumption takes place. During the first week 8 lineal feet for feeding space should be allowed for every 100 chickens; this should be later increased to 12 feet. Prior to the mash being covered with netting it is important that only a little food at frequent intervals be placed in the trays in order to avoid wastage.

In fact, the frequent feeding of all-mash appears to induce greater food consumption and better development.

Breeders who do not desire to feed an all-mash may make use of commercial chick grains and starting-mashes which may be fed as directed by the manufacturers. It has been the custom for many poultry-raisers to use scratch grain only for a short period of a chicken's life, but in view of the more satisfactory results obtained by feeding a ration of a relatively higher protein content than is usually contained in chick mixtures, early mash feeding appears essential.

Chickens may be reared satisfactorily upon moistened mashes and grain from about two weeks of age, but the mashes must be fed at frequent intervals. This system offers the advantage of utilising milk, when available, for moistening the mash. The feeding of dry mash, however, is suggested as a safer method, as the possibility of food becoming sour and the probable consequent bowel trouble among chickens are avoided.

All-Mash Mixtures.

The mixtures shown in Tables 6 and 7 are suitable for feeding young stock.

TABLE 6.

MIXTURES FOR CHICKENS—DAY-OLD TO 6–8 WEEKS.

Ingredient.	Mixtures.			
	1.	2.	3.	4.
Yellow Maize Meal	38	..	..	20
Wheat Meal	..	43	43	20
Sorghum Meal	..	20	20	25
Bran	20	20	15	10
Pollard	20	..	..	..
Lucerne Meal	..	..	5	5
Protein Meal (55 per cent.)	9	9	14	12
Buttermilk Powder	10	..	..	5
Liver Meal	..	5	..	..
Ground Limestone or Shell	1	1	1	1
Synthetic Riboflavin	..	..	(As directed by vendor)	
Vitaminised Preparation	1	1	1	1
Manganese-Salt Mixture	1	1	1	1
	100	100	100	100

If a good succulent green feed is not available to be fed in conjunction with these mashes a vitamin A preparation should be used as a supplement.

Owing to the impossibility of obtaining a wide range of ingredients, mixtures have to be very simple. Where bran is not available a good sample of crushed whole oats would make a useful addition. Oats are a valuable food. They have been omitted as they are not usually available.

TABLE 7.

MIXTURES FOR GROWING BIRDS—8–20 WEEKS.

(Birds having access to direct sunlight.)

Ingredient.	Mixtures.			
	1.	2.	3.	4.
Maize Meal	35	..	..	..
Wheat Meal	30	40	51	66
Sorghum Meal	..	22	12	..
Bran	10	10	..	20
Pollard	20	10	20	..
Lucerne Chaff (Leafy)	4	4	6	4
Protein Meal	5	8	9	6
Ground Limestone or Shell	1	1	1	1
Manganese-Salt Mixture	1	1	1	1
Liver Meal	4	..	..	2
Milk Powder	..	4	..	2
Synthetic Riboflavin	(As directed by vendor.)			

RATIONS FOR LAYERS.

Suitable laying mashes for feeding with grain are given in Table 8.

TABLE 8.

LAYING MASHES TO BE FED IN CONJUNCTION WITH GRAIN.

Ingredient.	Mixtures.				
	1.	2.	3.	4.	5.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Wheat Meal	26	..	..	..	..
Maize Meal	..	18	10	..	..
Sorghum Meal	..	..	..	23	20
Crushed Oats	..	..	23	..	..
Bran	16	20	..	16	16
Pollard	33	31	40	34	36
Meat and Bone Meal	10	14	14	13	13
Buttermilk Powder	4	4	4	4	04
Linseed Meal	..	2	..	..	..
Lucerne Meal	10	10	8	9	10
Salt	1	1	1	1	1

Supplements :—

Vitamin A .. .. Unnecessary if choice lucerne meal is fed ; otherwise feed fish oils.

Calcium .. .. .. Shell grit *ad lib.* or ground limestone or oyster shell at 2 lb. per 100 lb. mash.

Synthetic Riboflavin .. If buttermilk powder and liver meal are short, use synthetic riboflavin for breeders. In all rations buttermilk could be replaced by meatmeal or linseed meal and synthetic riboflavin added.

[TO BE CONTINUED.]

MARKETING

The Development of the Wheat-growing Industry in Queensland.

C. H. DEFRIES, Assistant Director of Marketing.

(*Continued from page 370 of the June issue.*)

Distribution of Production.

PLATE 15 has been prepared to illustrate the distribution of production in the various local authority areas of the wheat belt and clearly demonstrates the dominance of the shires of Wambo, Pittsworth and Jordaryan. Details of production are given in Table 2.

TABLE 2.

AVERAGE ANNUAL AREA OF WHEAT PLANTED FOR GRAIN, PRODUCTION AND YIELD PER ACRE IN VARIOUS WHEAT DISTRICTS FOR THE PERIOD 1940–41 TO 1945–46.

Source—Queensland Government Statistician.

Local Authority Areas and Statistical Divisions.	Area Planted.		Production.		Yield per Acre.
	Acres.	Percentage of State Total.	Bushels.	Percentage of State Total.	Bushels.
Wambo Shire	80,029	24·1	1,661,984	26·8	20·77
Pittsworth Shire	48,937	14·7	982,619	15·9	20·08
Jondaryan Shire	45,309	13·6	859,334	13·9	18·97
Clifton Shire	31,151	9·4	562,673	9·1	18·06
Millmerran Shire	24,654	7·4	514,395	8·3	20·86
Glengallan Shire	21,156	6·4	359,048	5·8	16·97
Allora Shire	19,936	6·0	400,892	6·5	20·11
Rosalie Shire	14,908	4·5	258,488	4·2	17·34
Cambooya Shire	13,040	3·9	217,688	3·5	16·69
Remainder of Downs Division	10,477	3·1	141,083	2·3	13·47
Bendemere Shire	8,643	2·6	84,090	1·4	9·73
Bungil Shire	6,602	2·0	56,036	0·9	8·49
Remainder of Roma Division	694	0·2	2,764	..	3·98
Rockhampton Division ..	3,820	1·2	44,876	0·7	11·75
Maryborough Division ..	2,126	0·6	26,393	0·4	12·41
Moreton Division	1,096	0·3	16,409	0·3	14·97
Central-Western Division	24	..	168	..	6·94
Cairns Division	4	..	80	..	..
Total, Queensland ..	332,607	100·0	6,189,032	100·0	18·61

The growth of the industry and the development of new areas bring in their train many problems. The areas fortunately are well served by railway communications, but the need to establish new storage

sheds and intake facilities for handling the grain at the new centres and to extend those which expansion has made inadequate has presented the Queensland State Wheat Board with a particularly difficult problem, which, of course, is rendered all the more acute by reason of the post-war shortages of labour and materials for building.

The whole question of future methods of wheat handling in the face of present expansion is one that has to be given careful consideration. It has to be asked whether a bulk handling system should be substituted for the existing methods of bagged handling and storage, and no doubt the experience of other States of the Commonwealth and other wheat growing countries will have to be drawn upon to provide a basis for the solution of what is a most pressing and important problem.

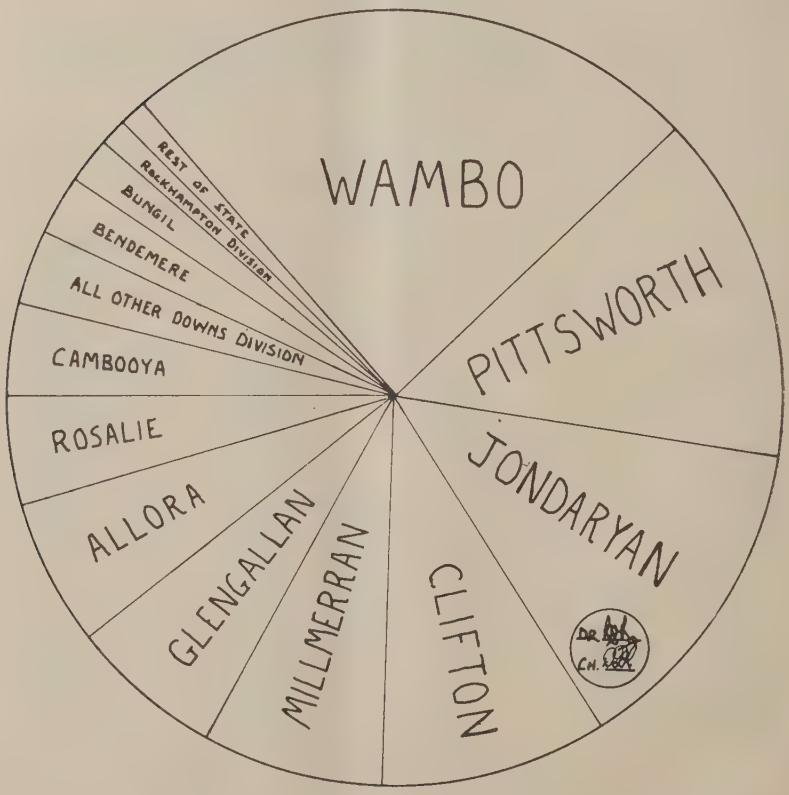


Plate 15.

WHEAT IN QUEENSLAND.—Chart showing the distribution of wheat production in local authority areas, based on the average area planted for the seasons 1940-41 to 1945-46.

Structure of the Wheat Industry.

Up to the present the Queensland wheat industry has been essentially one in which the small grower has predominated. During the period 1942-43 to 1945-46, an average of 82 per cent. of the growers in the State each grew under 200 acres. It has been indicated above that with mechanisation and the opening up of new country the larger wheat grower is more and more likely to become an important factor in the industry. Whilst this will give rise to problems which have not hitherto been encountered to any great extent in Queensland, nonetheless the smaller wheat farmers will remain an important group. They will continue to be influenced largely by the relationship between prices of wheat and of other products, but the value of wheat in the south-eastern Downs as a fodder crop will without doubt mean that the contribution from that area to the grain production of the State will continue.

Table 3 shows the number of growers of wheat and acreage planted in various farm size groups, averaged for the period 1942-43 to 1945-46 inclusive.

TABLE 3.

NUMBER OF GROWERS OF WHEAT IN VARIOUS FARM SIZE GROUPS. AVERAGE FOR THE PERIOD 1942–43 TO 1945–46.

Acreage Group, Licensed Areas.	Growers.		Area Planted.	
	Number.	Percentage of State Total.	Acres.	Percentage of State Total.
1– 49	730	25·97	21,793	6·38
50– 99	842	29·95	57,797	16·92
100– 149	504	17·93	57,925	16·95
150– 199	238	8·47	38,543	11·28
200– 249	159	5·66	33,446	9·79
250– 299	92	3·27	23,969	7·01
300– 349	81	2·88	25,487	7·46
350– 399	39	1·39	13,748	4·02
400– 449	34	1·21	13,868	4·06
450– 499	25	0·89	11,398	3·34
500– 599	29	1·03	16,082	4·71
600– 699	17	0·60	10,314	3·02
700– 799	8	0·29	5,835	1·71
800– 899	4	0·14	3,110	0·91
900– 999	3	0·11	2,304	0·67
1,000–1,999	6	0·21	5,525	1·62
2,000 and Over	(a)	..	506	0·15
Total	2,812	100·00	341,651	100·00

(a) The average is less than half.

Although it seems certain that mixed farming will continue its important role in wheat areas, wheat will become more and more the predominant activity on some of the farms.

In the 1947-48 season, for instance, plantings were greater by 140,000 acres than the 4-year average in Table 3 and most of this additional area was planted by growers in the group of over 200 acres. As this trend continues the proportion of the crop grown by the group under 200 acres will correspondingly fall. In the period covered by the table the "under 200 acres" group was responsible for approximately 50 per cent. of the crop. In the 1947-48 season this group only provided approximately 40 per cent. of the crop.

This development is of particular significance, because under such circumstances the wheat grower will tend to become increasingly dependent upon the wheat crop for a stabilised income. The power, machinery, equipment and buildings needed to grow wheat on a larger scale will require substantial finance, and commitments arising from this capital expenditure will have to be met year by year.

The wheat grower will, to the extent that he is predominantly a wheat grower, be unable to achieve adequate stability by the internal adjustment of the enterprises of the farm—that is, by transferring from wheat to dairying or other enterprises—as has been the case in the past in Queensland. A small-scale mixed farmer, particularly when using horse-drawn implements, naturally had a widely fluctuating income from wheat. He could not effectively handle any large area and, if seasonal conditions were against him, he perforce had to feed whatever crop he had to dairy cows or sheep as green feed. Again, if the price differentials were against wheat growing, he might refrain from harvesting for grain even if the crop was promising, and utilise his wheat for green-feed. He could do this because the capital expenditure incurred for wheat growing for grain was not high in relation to total farm capitalisation. Such adjustments between using wheat for feed or for grain are not practicable *to the same extent* under conditions of mechanised wheat growing, although as mentioned later it may be possible to find alternative outlets for the grain itself. Income stabilisation will to a greater extent depend upon the overall condition of the industry and the correlation of market demand and production. Moreover, if wheat prices are depressed it can be expected that other grains will tend to be in a similar position. Much, of course, will depend upon the extent to which grain becomes an integral feature of production in the pastoral industry.

It is possible that much of the new country will undergo a transition from an essentially pastoral area to one in which wheat, and summer grains such as the grain sorghums, will be significant features of the rural enterprise. This does not mean that the pastoral industry will decline in these districts, but that it may be more and more associated with agriculture. In this event the grains may be diverted to this extent from the existing markets and be utilised locally as a means of effecting a more scientific production of lamb, mutton and beef, or pig and poultry products. If this takes place such a transition will be a net gain to the pastoral industry, particularly as it will help to expand the use of grains for feeding in districts where they may not be produced in sufficient quantity for local needs; thus, whilst the developments outlined will result in a large increase in wheat production for grain, not all of this will necessarily be an addition to the present market supply. Further, with the development of a grain sorghum industry with an established feed market arising from more scientific feeding of stock, there will be more opportunities for the transfer of resources from one grain to the other and this will affect not only market stability but also the development of desirable soil conservation methods.

Should such an association between wheat, grain sorghum and the pastoral industries develop, the whole area will benefit from the resultant enhanced stability.

The State Wheat Board.

The State Wheat Board, which was established by *The Wheat Pool Act of* 1920, has played an important role in the development of the industry.

The immediate occasion for the formation of the Board was the difficulty Queensland was experiencing in obtaining wheat from southern States at the close of the first world war except at the then high prices for export wheat, together with the further difficulty experienced by Queensland growers in taking advantage of the export prices. In 1916-17 Queensland grew 227,000 acres of wheat. This fell to 128,000 acres in 1917-18, and in 1918-19 to 22,000 acres.

During the war the Queensland Government had unsuccessfully attempted on two occasions to have Queensland brought within the scheme of controlled marketing which operated in other States. The main purpose of this scheme was to organise shipping for the export of wheat. Local wheat growers were therefore denied the 9s. 0d. per bushel price at ports which was then the basis of export prices and were forced to sell individually without the protection afforded by the organised pool operating in southern States. Early in 1920 the State Government guaranteed 8s. 0d. per bushel for all prime milling wheat from the 1920 harvest in an effort to encourage wheat growing. The immediate result of this was an increase in the area planted to 177,000 acres. The need to form a pool to permit collective bargaining was recognised and *The Wheat Pool Act* was passed to confer powers on a State Wheat Board with respect to the marketing of the wheat harvest of the season 1920-21. With modifications, the Act was later extended by Proclamation from year to year. Proclamations, the latest of which was issued on 27th May, 1944, now extend the term of the Act for periods of six years.

The Wheat Board was the forerunner of the many compulsory producer controlled marketing boards which have been set up in Queensland under the State's marketing legislation. At the time, the wheat legislation represented a drastic departure from the principles of voluntary co-operation inasmuch as the compulsory element in pooling primary produce was then introduced. It is noteworthy that this principle was later adopted not only in other States of the Commonwealth but also in other parts of the world.

Prior to the formation of the Board flour millers or their agents purchased wheat from individual farmers, either on inspection or by sample, on the basis of the price at Sydney less cost of transport to Queensland. Where farmers were unable, owing to lack of storage facilities or for financial reasons, to hold their crop, they had no alternative to selling at the price offered.

The Board was designed to provide a means whereby wheat growers could collectively handle and dispose of the Queensland wheat crop; in fact, act as a single bargaining unit in the market, as contrasted with each buyer dealing separately with individual growers.

The whole of the marketing functions between the farmer and the flour miller were taken over. These included assembling, grading, storing, insuring, arranging for transport, and disposing of wheat on the grower's behalf. During the period of acquisition of wheat under National Security legislation the Board acted as the sole licensed receiver for Queensland on behalf of the Australian Wheat Board.

In addition to the strictly marketing functions of the Board various services are performed on behalf of growers and to these brief reference might now be made.

Hail Insurance.

The Wheat Board administers a co-operative Hail Insurance Scheme which is based on the payment of premiums by the wheat grower from the moneys due to him from the sale of wheat by the Board. The rate of premium levy varies, but usually approximates ½d. per bushel. The scheme covers growers against loss incurred as a result of damage to their crops by hailstorms, which may occur on any part of the Darling Downs, principally during the months of October and November when the crop is nearing maturity.

The scheme was initiated in 1927 when Hail Insurance Scheme Regulations were issued under *The Wheat Pool Acts*. These regulations give the Wheat Board the necessary authority to establish a Hail Insurance Fund created by the payment of a compulsory levy assessed on the basis of the quantity of wheat delivered to the pool.

This permits what would otherwise be a serious loss to individuals to be spread over the whole industry, and its value is to be seen in the position in the 1945-46 season, as shown in Table 4. This gives some indication of the operations of the fund and illustrates the benefits and protection it has afforded to wheat growers.

TABLE 4.

HAIL INSURANCE SCHEME—SUMMARY OF OPERATIONS 1939–40 TO 1946–47.

Season.	Total Amount Levied.	Levy per Bushel.	Amount Paid on Claims.	Assessment Fees and Expenses, &c.	Balance in Fund at End of Season.
	£	*d.*	£	£	£
1939–40	13,225	½	10,099	221	20,225
1940–41	11,008	½	1,538	35	29,659
1941–42	5,499	½	938	22	34,199
1942–43	9,172	½	10,663	105	32,603
1943–44	9,637	½	13,426	215	28,599
1944–45	12,589	½	340	15	40,834
1945–46	48,511	1½*	56,449	298	32,598
1946–47	1,010	½	227	..	33,381

* This rate applied to deliveries and wheat on which compensation was paid, the levy on excess wheat retained on farms being at the rate of 1d. per bushel.

NOTE.—All amounts have been given to the nearest £1.

Finance.

The Board prior to Commonwealth wartime controls obtained finance through the Rural Credits Department of the Commonwealth Bank against a bill of sale over wheat delivered and insured. This permitted a first advance of 80 per cent. of the estimated value to be given. The advantage of this to the grower was that it enabled him to receive a substantial payment prior to the actual sale of the grain, and eliminated the obnoxious practice that obtained in pre-pooling days of forcing a sale because of the grower's financial embarrassment.

Necessitous Growers' Seed Wheat Scheme.

Each year the State Government guarantees funds, usually not exceeding £5,000, and indemnifies the Queensland State Wheat Board against loss through failure to recover payments to that amount on account of seed wheat which the Board may supply to growers in necessitous circumstances. Applications for assistance under this scheme are made by statutory declaration to the Board, each application being considered by the Board on its merits. The money is recovered from the first advance payments made on the wheat delivered to the Board.

Seed Selection.

For many years past the Wheat Board has co-operated with the Department of Agriculture and Stock in encouraging the cultivation of certain types of wheat which have satisfactory field characteristics combined with good milling quality. At one time there were over 70 varieties in general cultivation; as a result of these efforts the number has been reduced to 41, and only 15 of these were planted in sufficient quantity in the 1947-48 season to exceed 1 per cent. of the total acreage. The general arrangement is that the Wheat Board only distributes seed which has been approved by the Department.

The classification and premium payment scheme conducted by the Board is dealt with below.

Wheat Classification and Varieties.

The controversy regarding the desirability and practicability of modifying the f.a.q. system of wheat selling under which wheat is marketed in all States other than Queensland has in recent years focussed attention on wheat grading and classification. The subject has achieved particular prominence since the visit to Australia in 1946 of Dr. Kent Jones, an eminent British cereal chemist, who was invited by the New South Wales Bread Manufacturers' Association to visit Australia to advise on the setting up of a bread research institute. Later a Commonwealth-States Committee was set up, following a decision of the Australian Agricultural Council, to examine the pros and cons of instituting a Commonwealth-wide system of wheat classification.

Queensland is the only State in the Commonwealth which has a comprehensive and organised classification and premium payment scheme for wheat. This is conducted by the Queensland State Wheat Board. It is largely based on a visual classification together with a grading for bushel weights, and provides four classes, namely Q1, Q2, Q2A and Feed. Q1 wheat attracts a premium of 3d. per bushel and Q2 1½d. per bushel.

It will be noted that on the average 77.79 per cent. of wheat is classed as Q1.

The system of classification followed in this State has been admirably suited to local conditions in the past, as almost all of the wheat was for home consumption. It also was well adapted to climatic conditions which at times causes pinching of the smaller grains such as Pusa, which are strong milling wheats but which on an f.a.q. basis might tend to weigh on the low side. Light-weight wheats of this nature which have not lost milling quality by reason of dry weather, but only weight, can be placed in the premium classes.

Table 5 sets out the proportion of wheat in each of these classes for the years 1939-40 to 1947-48:—

TABLE 5.

CLASSIFICATION OF WHEAT DELIVERED TO THE STATE WHEAT BOARD, 1939–40 TO 1947–48.

Proportion of Each Class.

Season.	Milling Wheat.			Feed Wheat.
	Q1.	Q2.	Q2A.	
	Per cent.	Per cent.	Per cent.	Per cent.
1939–40	77·88	17·88	3·60	0·64
1940–41	87·49	9·04	3·17	0·30
1941–42	80·21	13·95	5·50	0·34
1942–43	62·14	24·84	10·59	2·43
1943–44	61·27	28·20	8·59	1·94
1944–45	93·50	3·80	2·70	0·00
1945–46	81·89	11·46	6·06	0·59
1946–47	86·83	8·59	3·16	1·42
1947–48*	68·91	12·85	8·89	9·35
Average	77·79	14·51	5·81	1·89

* Subject to revision.

Queensland has natural environmental advantages for the production of high quality wheats which generally not only have a higher gulten content but also a superior quality gluten to those of other parts of the Commonwealth. This has been substantially reinforced by the breeding of varieties suited to local conditions. In the 1947-48 season wheat bred in this State constituted 75 per cent. of the crop.

Many claims have been made regarding deterioration in Queensland wheats but the record shows clearly that the proportion of varieties with medium to strong milling qualities has been increased. There have been, however, some changes in the composition of the group, and these are illustrated by Table 6. This sets out the area and proportion grown of the major varieties in two groups. The first includes those varieties considered as being medium to strong milling wheats; in the second group are those which normally are considered weak milling wheats, although the term "weak" is used only in a comparative sense in some cases.

The dominant position of the variety Puora, which constituted over one-quarter of the crop in the 1947-48 season, is of particular interest. Very favourable reports on this variety, which was bred by R. E. Soutter, as a desirable milling type have been given. The increase in the proportion of Puno is also marked. The two varieties Charter and Gabo, which are recent introductions from New South Wales, have also come into prominence of late years.

The decline in the area of Puglu from 17 per cent. of the crop in 1945-46 to 9 per cent. in 1947-48 is of importance, as much concern was previously felt regarding the popularity of this wheat, which was never officially released by the Department but which was found to yield particularly well under some conditions although its milling quality is not of a high order.

TABLE 6.

AREA AND PERCENTAGE OF VARIETIES GROWN IN QUEENSLAND, 1939–40, 1945–46, 1947–48.

Variety.	1939–40.		1945–46.		1947–48.	
	Area.	Proportion.	Area.	Proportion.	Area.	Proportion.
	Acres.	Per cent.	Acres.	Per cent.	Acres.	Per cent.
Pusa 4	21,058	5·84	6,986	1·75	6,003	1·24
Flora	45,137	12·52	22,221	5·57	10,345	2·14
Puora	29,584	8·21	89,027	22·32	128,501	26·54
Florence	19,603	5·44	3,801	0·95	1,103	0·23
Seafoam	35,018	9·71	29,874	7·49	33,612	6·94
Three Seas	31,839	8·83	22,061	5·53	22,208	4·59
Ford	21,806	6·05	16,637	4·17	17,343	3·58
Warput	20,608	5·72	22,507	5·64	16,095	3·32
Puseas	9,260	2·57	28,046	7·03	49,561	10·24
Puno	..	..	19,129	4·80	51,759	10·69
Charter	..	..	..	..	10,183	2·10
Gabo	..	..	..	..	8,517	1·76
Total	233,913	64·89	260,289	65·25	355,230	73·37
Eureka	..	..	28,051	7·03	8,361	1·73
Puglu	22,886	6·35	66,078	16·56	45,477	9·39
Novo	19,603	5·44	6,619	1·66	4,772	0·99
Seaspray	14,759	4·09	2,299	0·58	534	0·11
Currawa	13,338	3·70	7,684	1·93	2,940	0·61
Cedric	9,400	2·61	807	0·20	665	0·14
Gluyas	8,774	2·43	1,111	0·28	780	0·16
Fedweb	..	..	6,391	1·60	20,754	4·29
Others	37,786	10·49	19,606	4·91	44,601	9·21
Total	126,546	35·11	138,646	34·75	128,884	26·63
Total Queensland ..	360,459	100·00	398,935	100·00	484,114	100·00

The superior quality of Queensland wheats may well be a vital influence in the development of the industry in the future, and the need to take all necessary steps to ensure the maintenance of high quality is obvious.

It is now widely recognised that the milling quality of wheat is the result of a complex of influences which include not only variety, but environmental factors such as climate and soil fertility. However, even though in general terms environmental influences in Queensland give it better than average quality, some particular varieties have stood out as being particularly desirable milling wheats.

The above considerations emphasise that it would be undesirable for Queensland wheat to lose its identity in any uniform classification scheme on a Commonwealth-wide basis, although it might be that the existing classification and premium scheme in this State will need some revision if the maximum benefit is to be gained from the natural advantages that obtain, particularly in view of the possibility of permanent export surpluses.

The problem is one of exploring the position of the overseas market in relation to the special types of wheat available, and of providing a means whereby the grower himself is encouraged to concentrate production on the better varieties under favourable conditions.

Wheat Stabilisation and Prices.

Wheat is the most important agricultural crop in Australia and as one of the major sources of overseas funds the economic condition of the industry has always played an important part in determining the well-being of the Commonwealth. Queensland did not in the past, except for one year prior to the war, produce sufficient wheat for local consumption needs, and consequently the industry was not faced in so acute a form with the problems which confronted southern wheat areas as a result of violent fluctuations in export prices. Nonetheless, the industry here could not but be influenced to a significant degree by the economic condition of the industry generally. With the present expansion and the existence of substantial export surpluses there will naturally be an even closer link between external conditions and the industry in this State.

Plate 16 illustrates the extent of the post-war fluctuations in prices.

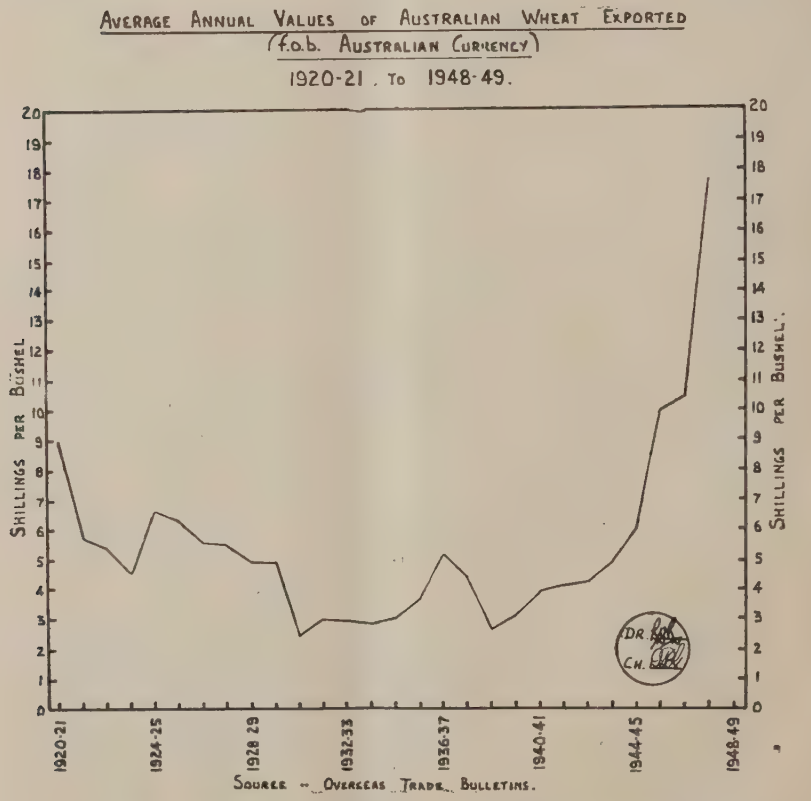


Plate 16.

WHEAT PRICES.—Graph showing average annual values (f.o.b., Australian currency) of Australian wheat exported, 1920-21 to 1948-49. (Source—Overseas Trade Bulletins.)

The general picture of instability that the wheat industry presented between the two wars was due to a complex of economic and other influences, but perhaps the most important were as follows:—

(*a*) The very high prices which prevailed subsequent to World War I led to attempts by European countries to increase production in rehabilitated areas.

(*b*) Optimistic settlement schemes in the Dominions, giving as they did an outlet for soldier settlement and migration, were proceeded with somewhat hastily and quickly provided increased production.

(*c*) Later the development of economic nationalism and the efforts associated therewith to diminish dependence on imported foods contributed to the uncertainties of the wheat market.

Many wheat growers found that the liabilities incurred during the boom periods of the post-war years were too heavy to be borne in the absence of Government assistance and stabilised markets and prices and, with the onset of the 1930-33 depression, wheat stabilisation became a vital issue in the rural economics of Australia. Up till this time the only efforts of any consequence that had been made to stabilise the industry were the Commonwealth pools organised during the first world war, when under the *War Precautions Act* wheat from the 1914-15 harvest was compulsorily acquired. This measure continued in force up to the 1920-21 harvest. However, this compulsory pool, to which Queensland was not a party, was primarily designed to organise shipping space for the export of wheat.

Following the first world war, voluntary co-operative pools operated in New South Wales, Victoria, South Australia and Western Australia, but, except in Western Australia, these handled a very small percentage of the crop. Even in Western Australia the percentage of total wheat production received by these pools declined from 96 in the 1921-22 season to 28 in the 1938-39 season.

Under the conditions of price fluctuation referred to above, the individual farmer had very little chance to achieve stability from his own unaided efforts. The Queensland wheat industry did not depend upon overseas markets for the disposal of the grain, but was certainly dependent on the condition of the overseas market as regards the price to be received. Consequently, the possibility of maintaining, or even of increasing, returns by reason of superior bargaining power, and economy in handling when organised under statutory authority, was a powerful incentive to the organisation of the State Wheat Board, as mentioned previously.

Table 7 shows the net returns to Queensland growers at country sidings for Q1 quality wheat from the inception of the pool.

In evaluating the net returns shown in the above table it is also necessary to take into account additional services rendered to growers by the Board, such as the administration of the Hail Insurance Scheme, the financing and insurance of the crop, seed selection, and the administration of the Necessitous Growers' Seed Wheat Scheme.

The introduction of the compulsory system of pooling permitted a measure of stability to be achieved that could not otherwise have been accomplished. Without the State Board the industry would have been particularly vulnerable to external conditions. However, whilst it was

possible to cushion the effects of price fluctuations and mitigate their influence within the State, economic conditions within the industry as a whole could not be completely by-passed. Consequently the efforts that were made over the years to establish a scheme of stabilisation for the industry in Australia were of substantial importance to Queensland. With export surpluses becoming available and with growers entering into heavy capital commitments to permit larger areas to be grown under mechanised conditions, the general trends in the world's markets must exert a powerful influence on local conditions that an isolated State Board could do little to remedy.

TABLE 7.

NETT RETURNS TO GROWERS FOR Q1 MILLING WHEAT AT GROWERS' SIDING, 1920–21 TO 1947–48.

Season.	Payments by State Wheat Board.	Payments by Australian Wheat Board.	Payments by Commonwealth and State Governments.	Total Payments.
	Per Bushel.	Per Bushel.	Per Bushel.	Per Bushel.
	s. d.	s. d.	s. d.	s. d.
1920–21	8 0	..	(a) 0 1·579	8 0
1921–22	5 0	..	..	5 0
1922–23	5 7·5	..	..	5 7·5
1923–24	5 3·5	..	..	5 3·5
1924–25	5 10·5	..	..	5 10·5
1925–26	6 3·5	..	..	6 3·5
1926–27	6 0	..	..	6 0
1927–28	4 11	..	..	4 11
1928–29	4 7·5	..	..	4 7·5
1929–30	4 0·3125	..	..	4 0·3125
1930–31	3 11	..	..	3 11
1931–32	3 6	..	(b) 0 4·5	3 10·5
1932–33	3 1	..	(c) 0 3	3 4
1933–34	2 10·625	..	..	2 10·625
1934–35	3 1·5	..	(b) 0 3	3 4·5
1935–36	3 11	..	..	3 11
1936–37	5 5·5	..	..	5 5·5
1937–38	4 0·125	..	..	4 0·125
1938–39	1 11·6875	..	(d) 0 4·549	2 4·2365
1939–40	(e) 0 2·5	3 2·958	..	3 5·458
1940–41	(e) 0 4	3 7·375	..	3 11·375
1941–42	(e) 0 3·25	3 7·625	..	3 10·875
1942–43	(e) 0 3·75	4 3·7	..	4 7·45
1943–44	(e) 0 3·75	5 1·833	..	5 5·583
1944–45	(e) 0 3·5	4 8·403	..	4 11·903
1945–46	(e) 0 3	·7 2·875	..	7 5·875
1946–47	(e) 0 3	(h) 9 1·5	..	9 4·5
1947–48	(g)	(g)12 1	..	12 1

NOTES:

(a) Amount made available to State Wheat Board by Queensland Government to meet guarantee of 8s. per bushel. The amount was distributed by State Wheat Board and hence is also included in that column.

(b) Commonwealth bounty.

(c) Relief payment by Commonwealth Government on wheat delivered. Additional payments were made on an acreage basis.

(d) Payment by Commonwealth Government on wheat delivered. Paid out of proceeds of Flour Tax.

(e) In these years, the crops were marketed by Australian Wheat Board, and State Wheat Board payments represent only Quality Premiums less Hail Insurance Levy of ·5d. per bushel.

(f) A levy of 1d. per bushel for Hail Insurance was deducted by Australian Wheat Board from payments to Queensland growers, and paid to State Wheat Board in this year. This figure includes a refund of Wheat Tax of 1s. 1·539d., plus interest.

(g) This pool is not yet complete and Quality Premiums have not been declared. Australian Wheat Board advances are not yet final.

(h) This figure includes a refund of Wheat Tax of 10s. 5d., plus interest.

Ever since 1914, efforts have been made by Governments and organisations within the industry to find an acceptable solution to the problem of stabilisation. Since the depression of the 1930's efforts have been even more intense. The disastrous collapse in prices in the early 1930's, when endeavours were being made to grow more wheat to increase exports to maintain the volume of credits in London, made wheat stabilisation one of the major economic problems confronting Australian primary industry. Until up to the outbreak of war many different plans were discussed, and some were embodied in legislation—for example the *Flour Tax Acts* and *The Wheat Stabilisation Act of* 1938. However, the operation of the last-mentioned Act was interrupted by the war, and it was not until 1948 that a peace-time Wheat Industry Stabilisation Scheme was finally given effect by the passing by all State and Commonwealth Governments of appropriate legislation.

At the outbreak of war in 1939 the Australian wheat industry was faced with considerable difficulty. Both Australia and Canada had large surpluses of wheat. Naturally it was the desire of the United Kingdom to buy wheat requirements as near as possible to her own shores in order to conserve shipping space and to diminish the danger of loss from enemy attack. As a consequence, wheat growers in Australia found themselves in a much less favourable position in regard to the disposal of their produce than did other sections of primary producers, such as those supplying wool, meat and dairy products.

As a result of the interruption to normal channels of sale and the dislocation of shipping facilities, and, further, because wheat was a staple food product the control of which was considered necessary for adequate defence, the Commonwealth Government used its war-time powers under the *National Security Act*, in September, 1939, to give effect to comprehensive control over both the production of wheat and the marketing of the crop. The scheme provided for compulsory acquisition by which the crop was required to be delivered to an Australian Wheat Board set up under National Security (Wheat Acquisition) Regulations, and for the registration of wheat farms and licensing of acreages under the control of a Wheat Industry Stabilization Board set up under National Security (Wheat Industry Stabilization) Regulations.

Queensland was the only State in the Commonwealth with a marketing organisation under statutory authority, and after considerable negotiation arrangements were made for the State Wheat Board to act as the sole licensed receiver in Queensland on behalf of the Australian Wheat Board. The State Board continued to conduct the hail insurance and classification and premium schemes on behalf of growers with the assent of the Commonwealth Board.

This system of marketing continued until December, 1948, when the war-time scheme was replaced by the wheat stabilization plan, hammered out after exhaustive negotiation between State Governments, wheat growers' organisations, and the Commonwealth Government, and given effect to by the passing of the Commonwealth Wheat Stabilization Bill of 1948 and complementary legislation in all wheat growing States.

This stabilization scheme, which commences with the 1948-49 crop and extends to include the 1952-53 crop, provides for a guaranteed price of 6s. 3d. per bushel f.o.r. ports bulk basis, for an export quantity of up to 100 million bushels. The guaranteed price will vary according to an index of production costs. The State legislation makes provision for a home consumption price equal to the guaranteed price. A stabilization fund is to be established by means of a tax on wheat exported amounting to 50 per cent. of the difference between the guaranteed price and the export price, but not exceeding 2s. 2d. per bushel.

In one very important respect this plan departs from what was generally accepted as an inevitable concomitant of such a scheme, namely production control. The legislation does not make any provision for the control of production, although States have agreed to ensure that wheat growing on marginal areas will be regulated.

As far as Queensland is concerned, the plan also departs radically from the type of organisation set up under National Security control in that the State's wheat marketing legislation has been retained intact and is fitted in as an integral part of the Commonwealth-wide scheme. The desirability of this approach is shown by the need to ensure that the Queensland Board is enabled legally to continue the Hail Insurance and Wheat Classification Schemes which have been of such value to Queensland growers. The legislation provides that effect is given to the plan by the State Wheat Board delivering wheat to the Australian Wheat Board on behalf of Queensland growers. The wheat will in the first place be delivered to the State Wheat Board under *The Wheat Pool Act* and be paid for by the State Wheat Board in accordance with this Act. The State Wheat Board will deliver the wheat to the Australian Wheat Board, and be paid for the wheat by the Australian Wheat Board under the new legislation.

One feature of the wheat situation which has tended to obscure the issue in regard to the need for stabilization has been the course of prices since the middle of the war. The rapid deterioration in the world food position from 1943 onwards resulted in phenomenal increases in prices of some food commodities. Wheat, particularly, changed from an over-supplied commodity to one in heavy demand with particular suddenness. Stocks in Australia declined from 152 million bushels on 30th November, 1943, to 11½ million bushels on 30th November, 1945. This was, of course, partly due to drought and crop failures in Europe in 1945, but it does reflect the increase in demand that occurred. The increase of export prices by 1947 up to an equivalent of over £1 per bushel at Australian ports did not provide an easy background against which to stress the need for stabilization. Since early in 1948 the course of prices has been downward, and there is every indication that this trend will continue. The graph in Plate 17, which is drawn from the "Economist" of 30th October, 1948, illustrates what has happened in the United States.

Conclusion.

It is clear from the foregoing that the most significant feature of the development of the wheat industry in Queensland is the possibility of regular participation in the export market of future years. Just how far this development will go is of course not easy to assess. The potential for further heavy increases in area is, however, obvious in view of the extent of first class agricultural lands available, although machinery

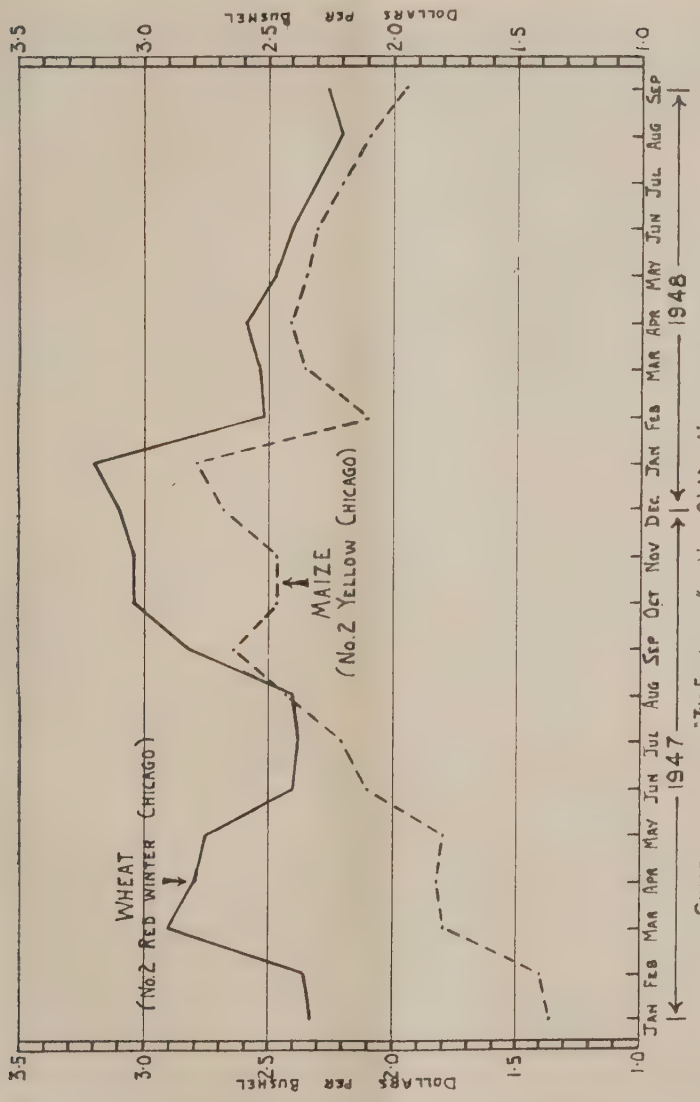


Plate 17.

Wheat and Maize Prices, U.S.A.—Graph (redrawn from "The Economist"), showing Chicago prices for wheat and maize in 1947 and 1948.

shortages are still something of a brake on production. Of course, the economic factors which will determine the relative profitability of alternatives in resource usage are difficult to assess on a long-term basis, but it appears to be a definite possibility that an average production of well over 20 million bushels will be achieved in the near future.

The export surplus will of course be dependent also on local consumption. During the war there was a very rapid increase in the usage of wheat in Queensland, particularly subsequent to the commencement of the war with Japan. The demand for flour then necessitated the operation of the flour mills at their full three-shift capacity and the Commonwealth Government policy of subsidising feed wheat, with a view to stimulating the production of pigmeats, eggs, and dairy products, led to a substantial increase in demand for these purposes. Total sales of wheat in Queensland increased from 6,025,608 bushels in 1941-42 to 10,643,236 bushels in 1943-44. By the end of 1944 wheat was being consumed at the rate of 13 million bushels per year. Even with the institution of feed wheat rationing early in 1945 consumption in this State was at the rate of almost 10 million bushels in 1944-45. However, by 1945-46 it had fallen to approximately 8¼ million bushels, and by 1946-47 to 7 million bushels. Normal consumption would, it is thought, be something greater than in 1946-47, however, as during this period wheat for stock feed was particularly short owing to difficulties of transport from southern States.

Table 8 shows the trend in consumption for various purposes.

TABLE 8.

WHEAT CONSUMPTION IN QUEENSLAND, 1939–40 TO 1946–47.

Year.	Milling.	Feed Trade.	Seed.	Sundries.	Total.
(*b*)	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.
1939–40 ..	3,843,955	952,550	49,407	(*a*)	4,845,912
1940–41 ..	4,439,568	969,352	76,185	(*a*)	5,485,105
1941–42 ..	4,776,533	1,170,165	78,910	(*a*)	6,025,608
1942–43 ..	5,992,571	1,857,376	81,155	(*a*)	7,931,102
1943–44 ..	6,794,058	3,722,900	126,278	(*a*)	10,643,236
1944–45 ..	5,671,124	3,874,011	208,387	61,633	9,815,155
1945–46 ..	5,272,634	2,745,278	127,874	66,412	8,212,198
1946–47 ..	4,749,676	1,870,192	178,968	130,541	6,929,377

(*a*) For these years sundries are included in feed trade.
(*b*) The year covered is from 1st December to 30th November.

Within Queensland itself it can be expected that wheat consumption will tend to increase, firstly because of increase in population, and secondly because of increased use of feed grains for livestock. In this, of course, wheat will have to compete with summer grown grains such as sorghum and maize. The development of more intensive methods of feeding dairy cattle and sheep, and of fattening beef cattle, is, of course, particularly important in this regard. Price relationships between the various grains and between grains and dairy, meat and poultry produce will, of course, be the determining factor. There can be no doubt that existing prices of feed grains retard their use for stock and poultry feeding.

So far as consumption generally is concerned it should be noted that, apart from the abnormal conditions of the war and post-war years and the consequent shortage of wheat and of other feeding stuffs, the tendency has been for the per capita consumption of wheat for bread in industrial countries to remain stationary or to decline. Studies made in this subject indicate that the most serious food shortages, apart from those which have arisen as a result of the war, have been in the protective

foods, which include items such as butter, milk, eggs and fresh fruit. It has been shown that, as purchasing power increases, the consumptive level of these types of foods tends to increase also. Wheat, which is an energy providing food, and which on lower economic levels is used as a substitute for the protective foods, does not show a similar consumption rise with increased incomes.

It has yet to be learnt whether this trend will be altered by reason of the increased use that can be made of the supplementary nutritional factors (such as vitamins and synthetic proteins) that can be added to bread. However, it is clear that, apart from the expansion of the market for stock feed, there is some doubt as to whether wheat consumption will expand in the present industrialised countries when the existing lag in supply is overtaken. Possibly, with increasing industrialisation and better living standards, the East will absorb a greater volume of wheat, but this is more likely to be a long-term development.

These considerations, together with price and production trends overseas, point to the possibility of a change from a sellers' to a buyers' market, and more intense competition amongst sellers. This may eventuate even if there is no collapse of the market such as occurred subsequent to the first world war and during the 1930's.

For the immediate future, therefore, it would seem that the industry in this State should take the opportunity to build up a reputation for high quality wheats that will be a bulwark against the effects of competition, and to this end every effort should be made to maintain the quality of Queensland wheat by means of proper selection of varieties and the efficient operation of farms with a view to maintaining the soil fertility upon which wheat quality is so dependent, and by ensuring adequate encouragement to growers of the high quality wheats.

Production Trends.

Suitable weather conditions in the first week of June permitted the start of the delayed general planting of wheat on the Darling Downs, and it appears certain that last year's record area of over 600,000 acres will be exceeded. It is estimated that 4,000 acres will be sown, partly for grain and partly for forage, in the Burnett.

The latest survey of the Queensland maize crop suggests that production will be at least three million bushels. Production on the Atherton Tableland is expected to be about 16,000 tons.

The estimate of grain sorghum production in the State is 1½ million bushels, exclusive of production on the Queensland-British Food Corporation project.

Harvesting of the autumn potato crop, which occupied about 5,500 acres, began in May, with an estimated yield of 11,500 tons. The May intake of the Potato Marketing Board was just over 53,000 bags, and 13,000 bags were imported from other States.

Several northern mills have commenced the 1949 crushing season, which promises to produce a larger crop of cane than the record of 1948, when 6,434,552 tons were crushed to yield 909,563 tons of sugar.

Butter and cheese production were lower in May than in the corresponding month of 1948, but prospects for winter production are fair.

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock, which qualified for entry into the advanced register of the A.I.S., Jersey, Guernsey, Ayrshire, and Friesian Societies' Herd Books, production records for which have been compiled during the months of January, February and March, 1949 (273 days unless otherwise stated).

Animal.	Owner.	Milk Production.	Butter Fat.	Sire.	Month Compiled.
		Lb.	Lb.		
AUSTRALIAN ILLAWARRA SHORTHORN.					
Mature Cow (Standard 350 lb.).					
Silver Glen Fairy Star	V. R. Nugent, Murgon	10,454·95	421·614	Aynsley Victory	January
Pilton View Trixie	F. Derrick, Moonford	10,339·5	436·544	Sunnyview Myrtle's Renown	February
Tarradale Bluebell	F. Derrick, Moonford	9,698·75	420·16	Spot of Sunnymeade	February
Fernhome Doris	R. S. Griffiths, Moregatta	9,073·75	416·388	Glengarry Gem's Royal	February
Sunnycrest Daphne 3rd	A. H. Sokoll, Wondai	11,712·25	412·505	Oakvilla Excelsior	February
Tarradale Bracelet	F. Derrick, Moonford	9,919·75	410·651	Spot of Sunnymeade	February
Fernhome Marion	R. S. Griffiths, Moregatta	8,749·6	401·725	Glengarry Gem's Royal	February
Fernhome Vicky	R. S. Griffiths, Moregatta	7,394·25	397·105	Glengarry Gem's Royal	February
Chelmer Honeysuckle 3rd	A. C. Marquardt, Mondure	9,856·75	392·619	Chelmer Champion's Renown	February
Fernhome Modesty	R. S. Griffiths, Moregatta	7,374·9	392·528	Glengarry Gem's Royal	February
Fernhome Josie	R. S. Griffiths, Moregatta	7,641·85	367·936	Glengarry Gem's Royal	February
Faversham Doris 2nd	H. V. Littleton, Crow's Nest	11,370·08	460·292	Chelmer Redman	March
Bantry Nellie	D. Sullivan, Pittsworth	10,341·3	459·558	Penrhos Blomsson's Prince	March
Applegarth Miss Emma 4th	F. Derrick, Moonford	11,052·75	454·542	Happy Valley Masterpiece	March
Rhodesview Queenie 27th	W. Gierke and Sons, Helidon	10,947·7	443·971	Fairvale Major	March
Rhodesview Butterfly 4th	W. Gierke and Sons, Helidon	11,674·15	445·45	Alfa Vale Nigel	March
Gentle of East Haldon	J. G. Lindenmayer and Sons, Mt. Sylvia	9,870·35	415·84	Epigram of Greyleigh	March
Calrossie Model 6th	W. D. Davis, Wambo	8,316·7	378·996	Fairvale Monarch	March
Glenore Shamrock 2nd	P. J. Donaghy and Son, Malanda	8,921·55	373·981	Sunnyview Melba's Hero	March
Applegarth Calm 8th	R. A. and N. K. Shelton, Hivesville	10,455·7	368·578	Applegarth Paramount	March
Fernhome Elaine	R. S. Griffiths, Moregatta	8,727·8	365·355	Glengarry Gem's Royal	March
Senior, 4 Years (Standard 330 lb.).					
Yarranvale Picture	W. Henschell, Yarranlea	12,491·14	541·627	Sunnyview Royal National	January
Fairholm Ivy 44th	R. A. and N. K. Shelton, Hivesville	10,689·9	373·164	Dulcamah Sundown	January
Ardilea Bud	H. W. Hinrichsen, Clifton	10,504·4	471·657	Newstead Reliance	March
Springleigh Pearl 11th	G. R. Moller, Monto	11,759·5	457·222	Blacklands Melba's Pride	March
Tesse of East Haldon	J. Lindenmayer and Sons, Mt. Sylvia	9,553·95	389·489	Epigram of Greyleigh	March
Junior, 4 Years (Standard 310 lb.).					
Glenroy Ida	W. F. Kajewski, Glencoe	9,005·0	411·661	Blacklands Shiek	January
Fairvale Dulcie 5th (173 days)	W. Henschell, Yarranlea	7,536·1	325·57	Fairvale Reward	January
Balater Opal Queen	T. W. Fowler, Pittsworth	7,544·0	319·083	Ennismore Reliance	February
Applegarth Roan Calm 2nd	R. A. and N. K. Shelton, Hivesville	9,277·6	338·823	Applegarth Paramount	March
Faversham Bud 11th	H. V. Littleton, Crow's Nest	8,578·95	328·601	Croydon Marchese	March

SENIOR, 3 YEARS (STANDARD 290 LB.).

Ripley Park Rosebud 3rd	I. B. Skerman, Kaimkillenbun	9,093·25	366·787	Newstead Jester	January
Vermont Hazel 36th	A. Lohse, Biggenden	8,959·4	311·319	Vermont Gamelin	January
Bingleigh Gentle 3rd	J. A. Lane, Kilcoy	8,217·05	310·219	Blacklands Jean's Victory	January
Alva Glen Orange	D. Birch, Memerambi	8,362·85	306·648	Springlands Favourite Prince	January
Alva Glen Biscuit	D. Birch, Memerambi	7,952·0	298·879	Alva Glen Lovely's Reward	January
Lynfield Heather Bell 3rd	F. E. Birt, Sexton	9,270·45	341·462	Parkview Ransom	February
Blacklands Miss Flirt 22nd	A. Pickels, Proston	9,168·2	310·041	Blackland's Carnation's Prince	February
Glen Idol Daphne 18th	Estate of P. Doherty, Gympie	11,722·7	423·626	Blacklands Count	March
Pilton View Jill	F. Derrick, Monto	9,306·25	349·67	Sunnyview Royal Day	March
Ripley Park Handsome 3rd	I. B. Skerman, Kaimkillenbun	7,834·01	346·502	Glenroy Security	March
Glen Idol Daphne 19th	Estate of P. Doherty, Gympie	8,997·65	331·119	Blacklands Count	March

JUNIOR, 3 YEARS (STANDARD 270 LB.).

Alva Glen Fairy	D. Birch, Memerambi	9,394·0	333·852	Alva Glen Lovely's Reward	January
Merridale Dolly	Giles Bros., Woowoonga	8,165·7	296·313	Springlands Pigeon's Eros	January
Fairvale Minerva 5th (191 days)	W. Henschell, Yarranlea	6,414·3	293·461	Fairvale Reward	January
Alfa Vale Model 29th	W. H. Thompson, Nanango	14,516·1	690·774	Alfa Vale Paisley	February
Blacklands Maiden 16th	A. Pickels, Proston	8,880·7	319·673	Blacklands Carnation's Prince	February
Jamberoo Winnie 9th	R. Herzig, Clifton	7,984·9	300·673	Murray Bridge Florrie's Prince	March

SENIOR, 2 YEARS (STANDARD 250 LB.).

Glen Idol Florrie 15th	Estate of P. Doherty, Gympie	8,196·4	328·484	Glen Idol Coronet	January
Ripley Park Rosebud 4th	I. B. Skerman, Kaimkillenbun	6,457·92	290·749	Glenroy Security	January
Glenroy Ettie	W. F. Kajewski, Glencoe	7,228·35	288·078	Fairholm Lewis	January
Glen Idol Daphne 26th	Estate of P. Doherty, Gympie	7,332·15	267·189	Blacklands True Blue	January
Glen Idol Daphne 25th	Estate of P. Doherty, Gympie	10,170·2	402·979	Glen Idol Regent	February
Euroa Design	P. R. Emery, Dallarnil	7,251·85	278·054	Euroa Tuppler	February
Bunya View Orphan	Mrs. A. E. Powell, Chinchilla	6,071·55	260·054	Trevor Hill Reflection	February
Navillus Countess 7th	A. F. Ezzy, Mt. Emlyn	6,488·1	256·235	Parkview Limerick	February
Yarranvale Empress 2nd	W. Henschell, Yarranlea	9,319·24	354·924	Sunnyview Royal National	March
Balcarres Choice 5th	H. V. Littleton, Crow's Nest	7,731·39	295·141	Valera Daphne's Prince 2nd	March
Fairlie Cherry 21st	Messrs. Mitchell and Mulcahy, Warwick	6,833·15	201·904	Corunna Potentate	March
Roshill Betty 7th	W. Flesser, Boyland	7,375·85	266·703	Dnalwon Felix	March

JUNIOR, 2 YEARS (STANDARD 230 LB.).

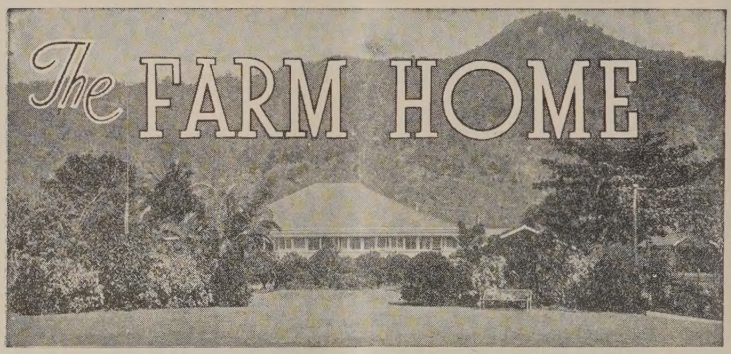
Applegarth Miss Merle 5th	R. A. and N. K. Shelton, Hivesville	9,691·85	417·275	Fairholm Evidence	January
Trevor Hill Model	Madge Bros., Southbrook	8,980·2	386·479	Fairvale Jellicoe	January
Sunnyview Evelyn 16th	J. Phillips and Sons, Wondai	8,810·1	359·861	Alfa Vale Lex	January
Trevor Hill Golden	K. A. Ruble, Motley	6,092·65	297·195	Fairvale Jellicoe	January
St. Andrews Gem 10th	M. C. Lester, Gleugallan	6,604·65	292·068	Tabbagong Victory	January
Trevor Hill Pamela	Madge Bros., Southbrook	6,716·57	282·235	Fairvale Jellicoe	January
Ennismore Bud 3rd	E. W. Jackson, Nobby	5,754·6	249·762	Ardilea Ossie	January
Sunnyview Little Princess 9th	J. Phillips and Sons, Wondai	12,385·55	558·015	Sunnyview Kitchener	February
Penrhos Merle 15th	A. Sandilands, Warwick	7,560·25	323·777	Rosenthal McArthur	February
Penrhos Elva 20th	A. Sandilands, Warwick	7,639·6	296·861	Rosenthal McArthur	February
Sunnycrest Daphne 5th	A. H. Sokoll, Wondai	7,434·6	271·167	Blacklands Review	February
Wamba Model	W. D. Davis, Chinchilla	6,111·1	249·43	Navillus Narcissus	February
Wenlock Queen	H. G. Watson, Killarney	6,299·3	244·147	Alfa Vale Repeater	February
Trevor Hill Rosetta	Madge Bros., Southbrook	7,900·1	348·108	Fairvale Jellicoe	March
Applegarth Calm 13th	R. A. and N. K. Shelton, Hivesville	8,440·65	317·365	Fairholm Evidence	March
Trevor Hill Fairy	Madge Bros., Southbrook	7,320·75	308·457	Fairvale Jellicoe	March
Dorravista Vision 12th	H. A. Turner, Tarazali	6,962·9	307·655	Learmont Byron	March
Calrossie Lilac 4th	D. Lithgow, Jandowae	6,997·05	280·749	Avnsley Eclipse 3rd	March
Derradale Butterfly	F. Derrick, Moonford	7,001·0	266·993	Sunnyview Royal Ruler	March
Hillfield Tessie	S. J. Lester, Mulgowie	5,408·85	248·763	Blacklands Florrie 9th's Heir	March
Sunnycrest Coral	A. H. Sokoll, Wondai	6,881·05	241·53	Blacklands Review	March

PRODUCTION RECORDING—*continued.*

Animal.	Owner.	Milk Production.	Butter Fat.	Sire.	Month Compiled.
		Lb.	Lb.		
JERSEY.					
Mature Cow (Standard 350 lb.).					
Kathleigh Dairymaid	R. J. Crawford and Sons, Kingaroy	6,482·15	368·611	Calton Larris	January
Woodbine Boronia	W. S. Conochie, Sherwood	9,081·75	473·668	Trinity Cute Ruler	February
Glenrandle Handsome Lady	P. Kerlin, Killarney	7,673·6	443·126	Bellgarth Stylish	February
Palen Candytuft	His Majesty's Prison Farm, Palen Creek	7,219·7	382·665	Trinity Ginger Chief	February
Lermont Bud	J. Schull and Son, Oakey	7,102·4	375·957	Selsey's Samares Hallmark	February
Brookland Golden Drop	W. S. Conochie, Sherwood	6,846·85	364·559	Oxford Golden Peer	February
Bellgarth Showgirl 6th	C. W. and E. M. Barlow, Boodua	6,668·55	363·723	Oxford Fawn's Victor	February
Golden Hill Golden April	J. J. Bugler, Wowan	9,484·4	507·248	Trinity Golden Chance	March
Wyreene Rene	C. W. Barlow, Boodua	6,090·95	381·348	Navua Boutilliere's Lad	March
Westbrook Starbright 5th	V. Dunstan, Kin Kin	8,171·25	379·73	Selsey Royal Standard	March
Glenview Sultane's Jubilee	W. S. Conochie, Sherwood	7,477·5	372·149	Trinity Governor's Hope	March
Oxford Lola 3rd	E. Burton and Sons, Wanora	8,198·4	367·111	Oxford Maid's Victor	March
Senior, 4 Years (Standard 330 lb.).					
Trecarne Golden Dairy Girl 4th	I. L. M. Borchert, Kingaroy	7,947·6	381·594	Trecarne Ruler 2nd	January
Nairfale Noble's Rosemary (365 days)	R. J. Browne, Yangan	11,308·8	535·655	Nairfale Pride's Noble	February
Wyreene Daisy Bell	C. W. and E. M. Barlow, Boodua	9,563·25	487·883	Wyreene Marcella's Boy	February
Glenbrook Rose Nella 2nd	J. F. Lovell, Samford	8,603·7	407·639	Lermont Golden Victory	February
Junior, 4 Years (Standard 310 lb.).					
Manneum Cosmos	R. D. Johnson, Kingaroy	8,505·1	476·002	Nimbrae Promoter	February
Glenrandle Tiny	P. Kerlin, Killarney	6,461·5	352·041	Bellgarth Glory King 2nd	March
Senior, 3 Years (Standard 290 lb.).					
Egmont Fussy May	I. L. M. Borchert, Kingaroy	6,127·8	348·299	Glenmaie Wonderful	January
Manneum Maidie	R. D. Johnson, Kingaroy	6,859·3	369·37	Nimbrae Promoter	February
Lermont Model 2nd	J. S. McCarthy, Greenmount	5,373·05	337·47	Trinity Noble Effort	February
Junior, 3 Years (Standard 270 lb.).					
Kathleigh Carol	F. W. Kath, Moffatt, *via* Dalby	8,047·25	438·77	Oxford Fawn's Noble	January
Brooklodge Victorine	J. Ahern, Conondale	6,727·65	350·08	Trecarne Some Victor 4th	February
Romsey Annabelle	J. Wilton, Killarney	6,051·4	292·928	Oxford Pixie's Victor	February
Senior, 2 Years (Standard 250 lb.).					
Glenmoore Lady's Maid	I. L. M. Borchert, Kingaroy	5,736·25	277·959	Woodside Bindle's Design	January
Kathleigh Soya 2nd	C. W. and E. M. Barlow, Boodua	5,435·55	331·929	Oxford Fawn's Noble	February
Trecarne Attractive Lady	G. V. Tilley, Beaudesert	5,438·55	279·824	Trecarne Some Duke	February
Sunny Brae Princess 2nd	M. E. McCracken, Avondale	5,540·65	259·621	Echo Hills Eminent Royal	February
Boree Effort's Dahlia	W. and C. E. Tudor, Gayndah	8,627·16	377·208	Trinity Daffodil's Effort	March
Locherbie Glorious	C. Beckingham, Everton Park	5,940·2	323·67	Oxford Tarzan	March
Upwell Mrs. Seymour	E. W. Goody, Bancroft	5,622·5	287 267	Glenview Some Sultan	March
Lermont Cowslip 3rd	J. Schull, Oakey	5,054·15	295·101	Trinity Noble Effort	March
Junior, 2 Years (Standard 230 lb.).					
Brooklands Regal Angela	W. S. Conochie, Sherwood	7,481·6	409·744	Brooklands Regalia	January
Glenrae Lady Skipton	V. Granger, Nerang	5,439·4	270·757	Oxford Skipton	January
Bellgarth Lucky Girl 2nd	D. R. Hutton, Cunningham	4,639·65	258·402	Walthorn Farm Brown Boy	January
Silverbrook Bertha	J. Schull, Oakey	4,161·2	235·36	Trinity Noble Effort	January
Broad View Effort's Barleycorn	W. S. Kirby, Byrnestown	5,139·7	234·976	Trinity Irondele's Effort	January

PRODUCTION RECORDING—*continued.*

Animal.	Owner.	Milk Production.	Butter Fat.	Sire.	Month Compiled.
		Lb.	Lb.		
JERSEY—*continued.*					
Brooklands Regal Angela (305 days)	W. S. Conochie, Sherwood	8,051·2	441·453	Brooklands Regalia	February
Glen Erin Madeira	J. S. McCarthy, Greenmount	5,738·65	319·916	Ashfield Prometheus	February
Lermont Rosella 2nd	J. Schull and Son, Oakey	5,750·15	306·186	Trinity Graceful Duke	February
Lermont Gold Dust	J. Schull and Son, Oakey	5,430·1	291·718	Trinity Graceful Duke	February
Broadview Royal Fern	W. S. Kirby, Byrnestown	5,546·6	271·329	Trinity Beauty's Hero	February
Broadview Royal Beauty	W. S. Kirby, Byrnestown	4,807·85	257·310	Trinity Beauty's Hero	February
Lermont Brightlass	J. Schull and Son, Oakey	4,284·1	246·223	Trinity Graceful Duke	February
Boree Effort's Briar	D. J. Louttit, Monto	9,841·5	477·59	Trinity Daffodil's Effort	March
Boree Effort's Lynette	D. J. Louttit, Monto	6,809·5	375·005	Trinity Daffodil's Effort	March
Ashview Ladyette	C. Huey, Sabine	6,043·0	322·553	Trecarne Some Tot's Duke 2nd	March
Oxford Valerie 3rd	E. Burton and Sons, Wanora	6,397·3	289·272	Oxford Franklyn	March
Oxford Lottie	E. Burton and Sons, Wanora	5,865·4	287·457	Oxford Franklyn	March
Inverlaw Syrian Viola	R. J. Crawford and Sons, Kingaroy	4,927·75	280·809	Oxford Royal Lad	March
Mabreen Belle	V. Dunstan, Wolvi	5,406·05	277·377	Trinity National Design	March
Coraldale Rainbow	W. A. White, Malanda	5,661·3	276·847	Peeramon Noble	March
Westwood Cheviot	F. Porter, Cambroon	4,443·05	276·395	Trecarne Golden King 2nd	March
Woodview Birdie	L. E. Marsden, Canaga	4,928·9	270·749	Ashview Peer	March
Romsey Fancy	J. Wilton, Killarney	5,274·5	258·5	Oxford Flying Fox	March
Lermont Queen 2nd	J. Schull, Oakey	4,493·8	253·271	Lermont Fair Lad	March
Brooklands Regal Prunella	W. S. Conochie, Sherwood	4,842·05	240·964	Brookland Regalia	March
GUERNSEY.					
MATURE COW (STANDARD 350 LB.).					
Fernhill Ivy (345 days)	H. Sanderson, Monto	9,338·75	495·543	Laureldale Pluto	January
Fernhill Hollyhock (365 days)	H. Sanderson, Monto	9,789·0	493·061	Laureldale Peace Boy	January
Laureldale Dot	W. A. K. Cooke, Witta	9,232·6	446·126	Laureldale President	February
Adaville Olga (365 days)	J. M. Cooke, Witta	9,972·8	549·083	Laureldale Rockfeller	March
SENIOR, 3 YEARS (STANDARD 290 LB.).					
Oakwood Bunny	E. G. Foxton, Maleny	6,320·5	314·447	Wirrawong Winter	January
JUNIOR, 3 YEARS (STANDARD 270 LB.).					
Oakwood Success	W. H. Doss, Degilbo	6,054·5	280·957	Fairfield Witch Boy	February
SENIOR, 2 YEARS (STANDARD 250 LB.).					
Laureldale Baby	W. A. K. Cooke, Witta	6,454·35	348·258	Minnamurra's Topsy's Sequel	March
Laureldale Louise	L. G. McKewen, Gayndah	7,035·19	320·945	Minnamurra's Topsy's Sequel 2nd	March
Laureldale Dorothy	L. G. McKewen, Gayndah	7,591·58	320·536	Laureldale Dan	March
JUNIOR, 2 YEARS (STANDARD 230 LB.).					
Linwood Delight	E. G. Foxton, Maleny	5,042·75	277·685	Wirrawong Winter	January
Golden Rae Princess	L. G. McKewen, Gayndah	6,003·3	280·07	Linwood Winkle	February
Brynworth Cordelia	A. A. Huth, Roadvale	4,876·2	243·571	Moongie Bonnie Willie	March
AYRSHIRE.					
MATURE COW (STANDARD 350 LB.).					
Eleresley Fuss 2nd	Stimpson's Ltd., Loganlea	9,311·95	397·289	Benbecula Banker	March
SENIOR, 4 YEARS (STANDARD 330 LB.).					
Eleresley Jonqruh	Stimpson's Ltd., Loganlea	8,124·35	357·617	Eleresley Major 2nd	March
FRIESIANS.					
MATURE COW (STANDARD 350 LB.).					
St. Athan's Sunny Molly	C. H. Naumann, Yarraman	12,444·8	439·131	Tent Hill Sunlight	March



When Should Baby Stand and Walk?

AT about 5 months of age most babies learn to turn over; first from the stomach to the back and later from the back to the stomach. When baby is placed on his stomach he kicks and squirms and sometimes discovers that he can push his body forwards by the movement of his arms and legs. Gradually, as he gets older, his muscles become stronger and he begins to creep—a movement similar to the walking of animals.

The age at which baby puts all his weight on his feet and stands up may be any time from 7 to 10 or 11 months. The average baby develops his own mechanisms with very little help and parents should assist, not by sitting or standing baby up before he is ready, but by providing the necessary incentives to development as well as—and this is *very important*—the right foods to build up strong bones and muscles.

Do not hamper baby with too many clothes or too tight napkins or panties. A play-pen is very useful and can be made by any handy man. The pen can first be used to encourage vigorous kicking and rolling exercise on a hard surface, which aids so much in muscle development. The sides of a play-pen are excellent for baby to learn to pull himself up, and if brightly coloured toys (strings of cotton reels coloured with vegetables dyes do quite well) are hung on the sides baby will be inspired to move around and examine them one by one.

When finally baby takes those first steps by himself—probably somewhere between 12 and 15 months—the parents must learn to be patient.

A baby who is just learning to walk will be wobbly in his gait and will look very clumsy. He keeps his knees stiff and his feet far apart and he will hold his arms stiff and use them for balancing. In spite of these precautions he will fall frequently until he gains control of his muscles.

Remember, it is baby who is learning, so let him shoulder his own responsibilities and face up to his own mistakes. Do not be over-sentimental about his tumbles—they have to come. Walking is a complicated mechanism, and baby has to learn not only to get his balance on the straight but to negotiate corners, climb elevations, and so on. He even has to allow for unexpected obstacles such as a slippery patch, a moving rug, or a strolling cat. Take reasonable precautions, but do not over-protect baby. He will not be afraid if he is encouraged and allowed to realise that it is his own lack of practice that is at fault and he really *is* improving.

Such conditions as severe illness or prematurity may make a baby late in learning to walk, but if he cannot walk by his second birthday he should be examined by a doctor to see what is holding him back.

Any parents who have problems on this and other matters connected with children may obtain further information by communicating personally with the Maternal and Child Welfare Information Bureau, 184 St. Paul's Terrace, Brisbane, or by addressing letters "Baby Clinic, Brisbane." These letters need not be stamped.

ASTRONOMICAL DATA FOR QUEENSLAND.

AUGUST, 1949.

By W. J. NEWELL, Hon. Secretary of The Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Day.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	6.30	5.18	Cairns	17	41	Longreach	29	40
6	6.27	5.21	Charleville ..	26	28	Quilpie	36	34
11	6.23	5.23	Cloncurry	44	58	Rockhampton ..	4	16
16	6.19	5.26	Cunnamulla ..	30	28	Roma	16	18
21	6.14	5.28	Dirranbandi ..	21	17	Townsville ..	15	35
26	6.10	5.31	Emerald	14	24	Winton	33	47
31	6.04	5.33	Hughenden ..	26	44	Warwick	5	3

TIMES OF MOONRISE AND MOONSET.

At Brisbane.		
Day.	Rise.	Set.
	a.m.	p.m.
1	10.40	..
		a.m.
2	11.19	12.10
	p.m.	
3	12.01	1.16
4	12.49	2.22
5	1.43	3.26
6	2.42	4.26
7	3.43	5.19
8	4.44	6.05
9	5.43	6.45
10	6.40	7.19
11	7.34	7.50
12	8.26	8.18
13	9.17	8.44
14	10.10	9.11
15	11.03	9.40
16	11.58	10.10
17	..	10.45
	a.m.	
18	12.56	11.25
		p.m.
19	1.55	12.12
20	2.55	1.07
21	3.52	2.09
22	4.45	3.15
23	5.33	4.24
24	6.15	5.33
25	6.54	6.41
26	7.29	7.47
27	8.04	8.53
28	8.40	10.00
29	9.18	11.08
30	9.59	a.m.
31	10.46	12.15

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19;
Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Day.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	24	13	40	29	15	3	46	32
6	30	9	46	23	21	1	54	26
11	22	15	38	31	13	6	43	35
16	12	25	27	41	2	17	30	49
21	9	30	25	45	0	21	26	53
26	18	19	34	35	9	10	38	39
31	30	9	45	24	20	0	53	26

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Day.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	41	14	57	40	42	25	34	14
3	51	8	65	36	49	21	42	8
5	56	2	68	32	52	17	46	3
7	54	4	67	33	51	19	44	5
9	45	10	61	37	46	23	37	10
11	35	20	54	44	39	29	29	18
13	26	31	47	51	32	36	22	26
15	16	40	41	58	26	43	14	34
17	11	49	38	63	23	49	10	41
19	3	56	34	67	18	53	4	46
21	2	55	33	67	17	52	3	45
23	9	47	37	62	21	47	8	39
25	20	35	44	55	29	40	18	30
27	33	22	52	45	37	30	27	19
29	44	12	61	38	45	24	37	12
31	54	3	67	32	51	18	44	4

Phases of the Moon.—First Quarter, 1st August, 10.57 p.m.; Full Moon, 9th August, 5.33 a.m.; Last Quarter, 17th August, 8.59 a.m.; New Moon, 24th August, 1.59 p.m.; First Quarter, 31st August, 5.16 a.m.

On 15th August the sun will rise and set 16 degrees north of true east and true west, respectively, and on the 12th and 26th the moon will rise and set approximately at true east and true west, respectively.

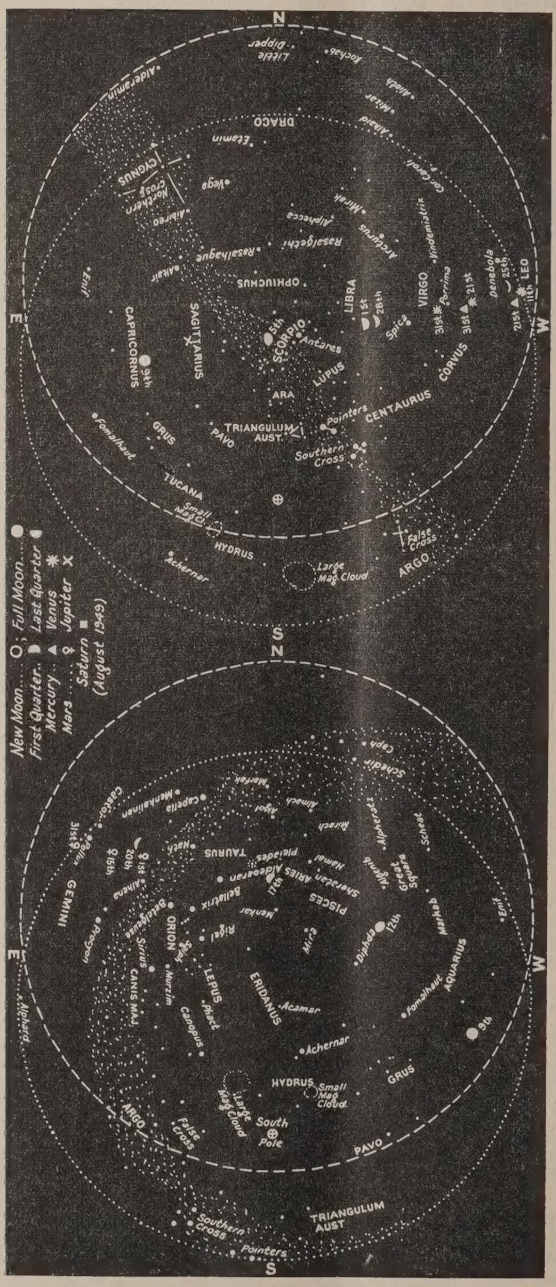
Mercury will be an evening object all this month. On the 1st, in the constellation of Cancer, it will set only 25 minutes after the sun, but by the end of the month, in the constellation of Virgo, it will set nearly 2 hours after sunset, reaching greatest angle east of the sun early next month. This is a most favourable time to observe Mercury.

Venus.—Now a brilliant object in the western evening sky, where it will remain for some time. At the beginning of the month, in the constellation of Leo, it will set 2 hours 8 minutes after the sun, and by the end of the month, in the constellation of Virgo, will set 2 hours 39 minutes after the sun.

Mars.—In the constellation of Gemini all this month; at the beginning, rising 2 hours before the sun; and at the end, rising about 40 minutes earlier.

Jupiter.—Continues to be an easily observed object during the month, being in a region of the sky where no particularly bright stars are situated. It can be observed for the greater part of the night.

Saturn.—Though at the beginning of the month this planet sets between 7.15 p.m. and 8.30 p.m., at the end of the month it will set only 8 minutes after the sun, so for the greater part of the month it will be too close to the sun for observation.



Star Charts.—The chart on the right is for 7.15 p.m. in the south-east corner of Queensland to 8.15 p.m. along the Northern Territory border on the 15th of August. (For every degree of longitude we go west, the time increases 4 minutes.) The chart on the left is for 10 hours later. On each chart the dashed circle represents the horizon as viewed from Cape York and the dotted circle the horizon for places along the New South Wales border. When facing north, hold "N" at the bottom; when facing south, hold "S" at the bottom; and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named. The stars which do not change their relation to one another, moving east to west, arrive at any selected position about 4 minutes earlier each night. Thus, at the beginning of the month the stars will be in the positions shown about 1 hour later than the time stated for the 15th and at the end of the month about 1 hour earlier than that time. The positions of the moon and planets which are continually changing in relation to the stars, are shown for certain marked days. When no date is marked the position is for the middle of the month.